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# COMMUNICATION DESIGN QUARTERLY

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*CDQ* is also committed to publishing inclusive and ethical research, and we expect that research at U.S.-based institutions that involves human subjects meets Institutional Review Board or Ethics Board approval, as appropriate. If the authors did use human subjects in their research, they should include a statement within the text of the article that states their article received IRB approval (whether that approval means it was ruled exempt or went to full board review). For international authors who work within systems that do not have IRB approval, the editor will work with the authors independently to ensure their work meets adequate ethical standards.

# Communication Design Quarterly

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# Gratitude, Care, and Resilience: An Introductory Editorial

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## INTRODUCTION

This summer my professional life was marked by a number of exciting changes. In addition to assuming the role of editor in chief of *CDQ* and producing my first issue, I stepped down from a longterm role with the editorial team at *Kairos: A Journal of Rhetoric, Technology, and Pedagogy*. In a bittersweet note, I received (and gave) a multitude of well wishes to the amazing colleagues and collaborators I had at Colorado State University, including Sue Doe, Lisa Langstraat, Tobi Jacobi, Todd Ruecker, Sarah Cooper, Chad Hoffman, Tiffany Lipsey, Dinaida Egan, and Meg Suter, while I started a new role as Chair of the Department of Professional and Public Writing at the University of Rhode Island. It was a summer full of packing, unpacking, painting—and new processes, policies, and people. Throughout this moment, I spent a great deal of time reflecting on this change. For instance, I reflected on what *CDQ* means to the fields of communication and user experience design (CD/UX), technical and professional communication (TPC), and writing and rhetoric studies (WRS). Similarly, I reflected on my editorial philosophy and how I will shape and alter it now that I've been entrusted with serving as steward of *CDQ*. In this opening editorial, I remark on three themes that emerged while contemplating these changes: gratitude, care, and resilience.

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### Gratitude

Foremost, I'm incredibly thankful for the opportunity to serve our organization and these fields in this role. Innovative is the first word that came to mind, when I looked over the body of scholarship that has been published in this venue since its inception. I am also grateful to mentors, colleagues, friends, and collaborators—Bill Hart-Davidson, Michele Simmons, Donnie Johnson Sackey, Kristen Moore, Dànielle Nicole DeVoss, Jim Ridolfo, Daniel Richards, Ehren Pflugfelder—who have prepared me to succeed in this role as well as previous editors of *CDQ*—Jordan Frith, Derek Ross, Kirk St. Amant—and members of the SIGDOC executive committee—Huiling Ding, Chen Chen, Daniel Richards, Luke Thominet—who have contributed to the success of this scholarly organization and its peer-referred research publication. Both the outgoing associate editor, Amber Lancaster, and the outgoing editor in chief, Jordan Frith, are also due special recognition for the labor, vision, and contributions they have made to *CDQ* during their tenure. Prior to handing *CDQ* over, Jordan and Amber devoted hours not just to copyediting, producing, and publishing cutting edge research in communication design, but also to caring for the venue. They have left a well organized archive of documents, developed templates, curated databases, and authored guides for style, accessibility, and production. Jordan also jumped on numerous calls to field production questions that arose over the summer. It has made a moment of significant transition in my life much smoother and humane than it might have been.

### Care

This summer I also attended Joshua T. Barnett and Donnie Johnson Sackey's seminar, "Rhetorical ecologies of care and design," at the Rhetoric Society of America's Summer Institute, which was hosted by the University of Cincinnati. Alongside of the now famous debate between Winner (1986) and Latour (2004) regarding the interrelationship of artifacts, technologies, and agency, seminar participants took up a discussion of the relationship between care and design via a set of curated readings (e.g., Bellacasa, 2017; Myers, 2013; Nieusma, 2004; Pezzullo, 2023; Whyte & Cuomo, 2016). From these readings, I drew connections to recent work

focused on care forwarded by scholars working across CD/UX, TPC, and WRS such as Colton (2016), Derkatch (2018), Novotny & Opel, (2019) Pender (2018), and, most importantly, work from field leaders, including Gonzales (2018; 2022), Haas (2020), Haas and Eble (2018), Jones, Moore, & Walton (2016), Jones and Williams (2020), and Walton, Moore, and Jones (2019), who have persistently argued that socially just forms of care must center anti-racist and anti-oppressive design and practice. With these arguments in mind, I reaffirm *CDQ*'s commitment to ensuring that *CDQ* follows the "Anti-racist scholar reviewing practices: A heuristic for editors, reviewers, and authors" (Cagle et al., 2021). In addition, in this opening editorial, I am making a personal commitment to engaging our editorial board, the SIGDOC executive board, and members of our field working at the forefront of social justice to advance diversity, equity, inclusion, and access within our editorial and publishing practices.

Already, I have implemented a developmental approach to editing at *CDQ* that draws from the experiences and practices I began learning in 2013 when Doug Eyman and Cheryl Ball invited me to serve as an assistant editor and that I've since honed practicing the craft of editing alongside Michael Faris, Chris Andrews, Elkie Burnside, Elizabeth Fleitz, Erin Kathleen Bahl, and Kristi McDuffie, and others who have come and gone over the years. For example, I have composed and sent out the first set of decision letters that synthesize reviewer commentary and provide authors with clear, actionable steps that they can take toward revising submissions that successfully address reviewer concerns. Within these letters, I have communicated that I am available to meet with authors to discuss their work, strategize their response to reviewer commentary, or partner on the development of revision plans. Beyond this, I plan to engage senior colleagues in CD/UX, TPC, and WRS who possess particular forms of subject matter expertise to serve as mentors when authors are working through thorny and complex ideas in their manuscripts. Additionally, I am available to meet with prospective authors to discuss works in progress or field questions about methodology, research design, and/or demystifying academic publishing.

Another influential aspect that will inform my approach, again drawing from my time with *Kairos*, is the deep care devoted to publishing accessible content. This extends *CDQ*'s existing commitment to accessibility, as Taylor and Frith (2023) previously developed the guide, "Accessible document design best practices," for authors to utilize. Toward this goal, I've invited Casey McArdle, who has published extensively on accessibility, accessible pedagogy, and communication design (e.g., Borgman & McArdle, 2019; Sonka, McArdle, & Potts, 2021; Tetu et al., 2024) to serve as an associate editor. Just a week ago, we had our first meeting and dug into the work of reviewing the current production practices, document templates, and scholarly infrastructure that have been in place at *CDQ*. Our goal is to identify opportunities to improve the user experiences for authors, reviewers, and readers—especially in terms of making the processes we use more transparent, equitable, and accessible to junior scholars in the field, members of industry, and community partners that we'd like to curate a deeper relationship with in this venue. Casey and I had an initial discussion about building an editorial collective, as we believe that broadening the depth of knowledge and expertise within the editorial team will enable us to strengthen *CDQ*'s ability to stay at the forefront of publishing innovative, justice-oriented scholarship. If you're interested in editorial work or you have a colleague or student who might be interested in working alongside of us, please be on the look out for an forthcoming call for additional associate and/or assistant editor positions.

## Resilience

A final theme that emerged throughout my reflections this summer is the importance of resilience. This is, of course, the most nebulous of the three themes, as partially, I think that resilience is to some degree tied up with adaptability. SIGDOC, as an organization, has a long and established record of adaptability—for instance, shifting from our earlier organizational emphasis from documentation to our current focus on the design of communication. Indeed, over the past six months, I've had a number of conversations with disciplinary and organizational leaders about what SIGDOC (in particular) and CD/UX, TPC, and WRS (more generally) stand to learn from the closure of the Society for Technical Communication (STC).

One notable example is that STC has served as a vital boundary organization (see Guston, 1999; 2000; 2001) bridging the gap between industry and the academic discipline of TPC. It seems like SIGDOC is uniquely situated to step into this space and curate meaningful relationships between practitioners and scholars in community, industry, and government roles responsible for UX, CX, UX writing, content strategy, and—increasingly—designing smart and connected communities (S&CC) that leverage emergent technologies "with natural and built environments to tackle critical challenges and enhance the quality of life in communities through collaboration with stakeholders" (NSF, 2025).

It is certainly a moment of profound uncertainty and flux—for both our interdisciplinary fields and society more broadly. Yet, I'm optimistic and hopeful that scholars across CD/UX, TPC, and WRS have a great deal to offer in this moment. Working towards building resilient communities with technology—emergent, digital, broadcast, analog, embodied, or otherwise—as the body of research across our fields has continually demonstrated, requires careful, ethical, and just engagement with communities. With this in mind, I offer a set of questions that, perhaps, might serve as an initial orientation to the type of work I believe scholars, practitioners, community members, designers, and/or scientists are eager to take up across the fields of CD/UX, TPC, WRS, content strategy, and S&CC:

- How might scholars working within or across CD/UX, TPC, and/or WRS work to improve the availability, comprehensibility, and approachability (i.e., accessibility) of theories, concepts, knowledge, and expertise within these fields in order to articulate the critical value and importance of humanistic and justice-oriented stances toward communication and communication design to external audiences?

- How might scholar-teachers across the academic fields of CD/UX, TPC, and/or WRS responsively and critically engage practitioner, industry, and/or community organizations who share a concern for digital and technological literacy by cultivating pedagogies that advance critical orientations and practices toward teaching and learning both emergent and legacy technologies?

- How might scholars across the academic fields of CD/UX, TPC, and/or WRS envision, develop, critique, socialize, and

iterate research methodologies and methods that prioritize the usefulness of cultivating deeper (i.e. inclusive), stronger (i.e. equitable), and more lasting bonds (i.e. just and belongingness) between practitioners, industries, workers, customers, governments, citizens, students, and teachers over other arbitrary values and commitments?

Each of these questions, then, talks back toward the broader theme of resilience, as each anticipates the short-term challenges facing academic fields, research and learning institutions, and scientific organizations.

## ISSUE CONTENTS

Last, I'd like to take a moment to briefly introduce the exciting pieces of scholarship that appear in this issue. First, Dorcas Anabire's "Using social media as a user-centered design tool: Types of user feedback useful for iterative design" provides a case study of how user feedback that is publicly available within social media sites such as reddit might be leveraged in order to improve the usability of tools and technologies in development. This article stands out, in particular, because of Anabire's clear-eyed focus on the importance of accessibility, but also because it offers a pragmatic approach toward implementing user-centered design when resources necessary for iterating designs or conducting formal usability testing is limited. Next, Jacob D. Richter's "Designing social media learning environments to promote digital literacy" offers a consideration of existing research surrounding pedagogies for teaching and learning digital—and to put a finer point on it—social media literacies. Drawing from an analysis of artifacts, reflective journals, and interviews with students, Richter offers a data-driven account of the use of Slack, a widely used collaboration platform, to scaffold digital and social media literacy learning in his class. Thereafter, Sonia H. Stephens and Amanda Altamirano detail their experiences collaborating on a funded research project alongside of an interdisciplinary team of researchers to design a risk communication website, HazardAware. In particular, Stephens and Altamirano account for their research design, meticulously outlining steps that comprised a multiphase usability study, while also reflecting on opportunities that other CD/UX researchers might seek to foreground social justice outcomes in similar projects. In addition to these research articles, our book review editor, Kristin Bennett, has curated two excellent assessments of recent monographs. Thomas Gurinskas offers a review of Patricia Dancer's (2024) *Queer techné: Bodies, rhetoric, and desire in the history of computing*, whereas Phillip Lovas offers a review of Kristin D. Pickering's (2024) *Environmental preservation and the Grey Cliffs conflict: Negotiating common narratives, values, and ethos*. Each of these book reviews provide a useful overview of the monographs, and most importantly, illustrate clearly why *CDQ* audiences will want to engage with their arguments.

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## ABOUT THE EDITOR

Timothy R. Amidon is an associate professor and chair of the Department of Professional and Public Writing at the University of Rhode Island. His scholarship explores the nexus of technology, risk, agency, and design and has appeared in *Technical Communication, Technical Communication Quarterly*, *Journal of Business and Technical Communication*, *Kairos: A Journal of Rhetoric, Technology and Pedagogy*, *Communication Design Quarterly*, and other venues. His collaboratively authored book *Undermining risk in technical communication: Extractive industry, cascading disaster, and the global climate crisis* (with co-authors Ehren H. Pflugfelder, Daniel P. Richards, and Donnie Johnson Sackey) is forthcoming with the SUNY Press, Studies in Technical Communication series (Eds. M.A Kimball, D.G. Ross, & H. Sarat-St. Peter).

# Using Social Media as a User-Centered Design Tool: Types of User Feedback Useful for Iterative Design

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## ABSTRACT

This case study demonstrates that user feedback on social media is valuable for informing iterative product design for marginalized populations. Using content analysis, I analyzed 136 posts and comments from the reddit platform of a product (SteadyMouse) designed for people with Parkinson's disease. The analysis revealed four patterns in user feedback that may be useful for product redesign: technological details, embodied experience of the product, usage scenarios, and prioritization. While User Centered Design is often cost-intensive, this study suggests designers can intentionally solicit useful information from users in social media forums by offering a dedicated space on websites where product designers related to these four key topic areas.

## CCS Concepts

Human-centered computing → Human computer interaction (HCI) → HCI design and evaluation methods → **Usability testing**

## Keywords

user centered design, user documentation, help systems, social justice, product design

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## INTRODUCTION

The Interactive Design Foundation (2016) has defined User-Centered Design (UCD) as an "iterative design process in which designers focus on the users and their needs in each phase of the design process" (para. 1). Iterative design process results in the updates, refining, and change of designs and affords designers the opportunity to consider feedback from users to improve the product design. One way to improve user-centered design in technical and professional communication (TPC) is through integrating social justice principles into the design process by ensuring that the needs of marginalized and underrepresented users are not only recognized but rather prioritized. The discipline of technical communication (TC) has embraced the social justice turn: an approach where TC scholars are encouraged to identify and acknowledge injustices, systems of oppression, and their own involvement in them, expose these issues as a means of initiating change at social, and political levels, reject these injustices, the systems that sustain them, and any opportunities to continue oppressive practices and replace them with inclusive and coalition-driven practices (Walton et al., 2019). Given this focus, it is prudent to pay ample attention to specific users' feedback on our designs, which will help technical communicators recognize, reveal, and reject design choices that might oppress marginalized users, such as users with disabilities, and replace them with inclusive and user-centered design practices (Walton et al., 2019).

Recent scholarship in TC has raised concerns on issues connected to UCD, including participatory localization (Agboka, 2013), social justice (Colton & Holmes, 2016; Jones, 2016; Walton et al., 2019), usability (Acharya, 2017; Breuch et al., 2001; Chong, 2016; Redish, 2010), and accessibility (Browning & Cagle, 2016; Youngblood et al., 2017; Zdenek, 2018). These studies have together discussed social justice, usability, user-centered designs, accessibility, and disability studies in technical communication pedagogy, practice, and research. If the importance of UCD cannot be overemphasized, and technical communicators agree that UCD improves design and should involve users, then why aren't we doing it more? One reason is the cost involved in engaging in traditional UCD

practices (Bias & Mayhew, 2005; Nielsen, 1994). As we strive to achieve accessibility in the design of products for marginalized users such as users with disabilities, what can designers do to enact effective UCD that can improve the design of their products and the inclusivity of their products? Breuch (2018) asserted that social media can be used to collect feedback to improve the usability of websites. However, few studies have been conducted to identify what types of feedback on social media can be useful for improving the design of products. This study seeks to fill this research gap by answering the research question: What kinds of user feedback that could be solicited via social media would be useful for informing iterative product design?

I posit that one of the ways that designers can engage in iterative product design with limited resources is by soliciting user feedback via social media. In this article, I identify specific types of information that designers can solicit via social media, information likely to be particularly valuable for informing design revisions: product-relevant literacy feedback (technological literacy & embodied literacy), usage scenario feedback, and prioritization. To identify these types of valuable information, I analyzed a product's social media forum to identify the types of user feedback that can help in iterative product design, especially products designed like the one used in this study.

# THE CASE STUDY: STEADYMOUSE

SteadyMouse is an assistive software created by SteadyMouse, LLC. The idea of the SteadyMouse came into being in 2005 when the developer and designer, Benjamin Gottemoller, looked for solutions for his grandfather, who was diagnosed with Parkinson's disease. He aimed to make it possible for his grandfather to use the computer without the unwanted movement of the computer mouse that comes with people with Parkinson's disease. He thought about ways to design software to remove the "tremor while leaving intended cursor motion intact" (Gottemoller, 2024, para.3). He spent time putting the software through coding and digital signal processing, and this had come through updates to the current version of SteadyMouse. Not only did the software benefit his grandfather, but it has also been commercialized for others with Parkinson's disease and other tremor-related issues that hinder the use of the traditional computer mouse.

The design of the software is intended to "fiercely ally against essential tremor and the variants that often accompany Parkinson's disease and multiple sclerosis" (SteadyMouse). In order to block the unwanted movement of the mouse due to the severe tremor experienced by people with Parkinson's disease, the software is installed on a computer. The software can detect and remove shaking before it reaches the computer cursor and blocks accidental clicks, so the entire process of using the computer becomes a smooth experience. This software can also make it possible to detect where a user's cursor is trying to go just by tapping a button. According to Bani Hashem et al. (2014), the software "processes incoming data using a Windows-based finite impulse response (FIR) filter that has different coefficient and order of magnitude for each position on the slider bar" (p. 97). Since its inception, SteadyMouse has undergone re-engineering, modification, and updates to achieve its current state. Even with that, updates are still occasionally carried out to improve the software's usability and user experience. I now turn to the review of relevant literature on UCD and related concepts.

# LITERATURE REVIEW

Our field has long advocated for the involvement of users in the design process. Putting users first and making users co-designers of products is a widespread goal, if not a widespread practice, in technical communication. The involvement of users, especially marginalized users, in the design process can enhance the usability and accessibility of designs, leading to better designs that account for the lived experiences of users. Studies in the area of design have looked at using design to enact social justice (Opel, 2014; Schoch et al., 2019), engaging users in the design of technology (Ahtinen, 2009), using user-centered methods to design for diverse populations (Duque et al., 2019; Putnam et al., 2009), cost-justifying usability (Bias and Mayhew, 2005), designing for usability (Acharya, 2018; Gould and Lewis, 1985), and minimizing usability cost (Nielsen, 1994). In the subsequent paragraphs in this section, I review concepts closely related to UCD in the contexts of agile software development and inclusive design. I believe these concepts are crucial in user-centered design in product improvement, as they can be used to include marginalized users in the design process.

## User-centered Design and Agile Software Development

According to Atlassian.com, "Agile methodology is a project management approach that involves breaking the project into phases and emphasizes continuous collaboration and improvement. Teams follow a cycle of planning, executing, and evaluating" (para. 1). Silva da Silva et al. (2011) argued that agile methods and user-centered design methods differ in that the agile method focuses on delivering a small set of software features to customers in short iterations, and UCD spends more time and resources on research and analysis before the development of the product. Though these two methods have different traditional approaches, they can be used together, where agile methods are incorporated into the user-centered design process. Blomkvist (2005) established a connection between agile software development and user-centered design by comparing the values and processes of both methods. Blomkvist (2005) found that an essential principle of user-centered design is that users are actively involved in the design process, and agile methods tend to be used in software development where products are released and then iteratively improved based on customer feedback.

The usability testing stage of both methods allows users to give feedback to designers and developers to reevaluate the software or product. Some scholars might argue that agile methods' reliance on customers is not the same as users; however, in the SteadyMouse case study, users are the same as customers, and as such, I argue that users can take the role and act as customers of products and vice versa. Zorzetti et al. (2022) suggested combining agile methods and UCD in designing software because agile methods alone have limited problem understanding and solutions. According to the authors, combining agile methods with UCD will help designers meet users' needs. Cockton et al. (2016) acknowledged that incorporating user-centered design into the agile method can be challenging. Humayoun et al. (2011) presented a framework for incorporating UCD into agile software development through a three-step approach:

> at the process life-cycle level for the selection and application of appropriate UCD methods and techniques in the right places at the right times; at the iteration

> level for integrating UCD concepts, roles, and activities during each agile development iteration planning; and at the development-environment level for managing and automating the sets of UCD activities through automated tools support. (p. 55)

According to Humayoun et al. (2011), one challenge of software development is how to involve end users in the design and development stages where designers can collect and analyze user feedback; however, incorporating UCD takes care of that challenge. UCD involves users from the earliest stages of the design process, making it an essential approach in software development. Since users are the ultimate end-users of the software, their input is crucial in shaping how the software is designed.

## User-centered Design and Inclusive Design

According to the British Standards Institute (2005), "inclusive design is the design of mainstream products and/or services that are accessible to, and usable by, as many people as reasonably possible …without the need for special adaptation or specialized design" (p. X). In technical communication pedagogy and practice, inclusive and user-centered design are key concepts that scholars pay particular attention to. Within their guest introduction to a special issue of *Technical Communication* focused on localization, for example, Lancaster and King (2022) observed "that design decisions are complex, requiring reconciliation, compassion, empathy, and acceptance by both designer and user to ensure that the information product embraces a more balanced design" (p. 1). It is important for product design to explicitly and intentionally account for users with disabilities. Therefore, it's important for UCD to seek out and involve users with a range of abilities for general products intended for widespread public use and certainly for products like SteadyMouse, which are intended specifically for users with disabilities. Agboka (2013) asserted that user-centered design is vital because when manufacturers or developers involve users as co-designers of products, users can determine the localization of products so that developers can produce usable and accessible products. I agree with Agboka's (2013) claim because when users are co-designers of products, we strive towards achieving accessibility and social justice.

# METHODS

## Data Collection

Data for this study was collected from the product's reddit forum. reddit is a social media platform that is a "network of communities where people can dive into their interests, hobbies, and passions" (reddit, n.d.). People with similar interests create a forum to share ideas. The reddit forum of SteadyMouse is embedded in the product website, where users and people interested in the product interact with the SteadyMouse developer and other users. The SteadyMouse reddit forum, therefore, presents a medium for user-developer interaction. Though the reddit forum replaces the face-to-face meetings designers may traditionally have with users in UCD; it fulfills the same purpose as face-to-face conversations. Also, the reddit forum allows for researchers to observe user-developer interactions, which are foundational to UCD and the research question informing this study. I used these user-developer interactions on reddit for this research because the data shed light on how small companies involve users in the design and use of their products. The data enables me to explore and examine how developers and designers engage users in the design process, thus relevant to my research question. Also, the product's reddit forum is small enough that I could conduct a detailed analysis of all the data.

I copied and pasted each post and comment onto an Excel document and manually coded 87 comments and 49 posts, which were posted between 2016 and 2022. Seventy of the posts and comments were submitted by the developer, 47 from direct users, 12 from indirect users, and seven from users whose roles are unknown.

- Direct users: people who use SteadyMouse themselves.
- Indirect users: people who are not direct users of the product but seek to help direct users get the product and sometimes guide them on the product usage.
- Unknown: people whose identities could not be established based on their conversations on the forum.
- Developer: The SteadyMouse designer and founder.

On reddit, there are two common types of conversation: posts and comments. Posts are the initial questions or information, and comments are replies to posts. In the data, it was typical for some posts to receive at least one comment while others did not. This was because some posts, such as software update announcements from the developer, did not necessitate a comment.

## Data Analysis

Qualitative content analysis is the systematic method of analyzing texts through rules (Thompson, 1999). Qualitative content analysis was used to identify and describe patterns in the data and make inferences useful to the research question: What kinds of user feedback that could be solicited via social media would be useful for informing iterative product design? I analyzed the data, looking for codes. I used code to mean "tags or labels for assigning units of meaning to the descriptive or inferential information compiled during a study" (Miles & Huberman, 1994, p. 56). Codes emerged inductively from patterns in the data. Working iteratively, I produced an initial list of potential codes, which I reviewed with a research partner. We worked together to hone down the initial list of codes to those most salient to the research question. After two iterations, we settled on four major codes, each of which we further divided into sub-codes. These sub-codes allowed me to identify more fine-grained patterns in the data relevant to the research question. I applied the codes to each datum; thus, I treated each post or comment as a distinct chunk of the data that warranted the application of a major code and then a sub-code. It must be noted that only one of the major codes and its sub-codes are reported in this article: the major code is user-support, and the associated sub-codes include problem identification, recommendation, and tips. The rationale for focusing on this code was driven by its relevance to the goals of the study. User support emerged as a vital major code that sums up users' experiences and offers a comprehensive understanding of the challenges and strategies they encountered when using SteadyMouse. The other major codes not reported in this study are relationship building and updates.

## Major Code: User Support

*Definition.* Posts and comments that identify a problem with the software and ask for help fall under this bucket. This category also includes posts and comments that imply the users or developer is checking in to see how the product is working and how users are finding the product and updates. Recommendations on the settings to incorporate into computers to enjoy the software is also seen here.

## Sub-codes

### *Problem identification*

*Definition*: This subcode pertains to information describing a problem and/or requesting help.

*Example from data*: "Problem with Microsoft Excel - ScrLk. Hi, I started using Steadymouse about a month ago and I discovered that it has an undesirable affect when I use Excel, I can't move the courser in Excel by using the arrow keys on my keyboard. When I use Excel (daily) I move the courser often by using my arrow keys on my keyboard. After struggling with the problem for several days I decided to diagnose the problem and found that my keyboard "Screen Lock" was enabled and I need to unlock it. The problem was that there is no screen lock (ScrLk) key on my keyboard! I have a touch screen on my laptop and I needed to turn on my touch screen keyboard to disable the ScrLk, this is somewhat obtuse and took a while to find the problem. Anyway, is there a way to disable the interaction between steadymouse and ScrLk?"

### *Recommendation*

*Definition*: This sub-code includes posts and comments from developers or users that recommend activating an existing feature in their settings to get things working and, in rare cases, posts and comments that recommend a third-party application to users. Note: This subcode differs from tips because it's about a specific problem.

*Example from data*: "For the present I recommend setting a low enough mouse speed to get through single clicks OK (And double clicks if it isn't excessively slow). The "Icon Targeting System" can help with the rest by homing in and performing double clicks on many things for you: https://www.steadymouse.com/manual/#icontargeting FYI, there is a feature in the works somewhat related to what you are asking, however it is not ready just yet."

### *Tips*

*Definition*: This subcode applies to general information about using the existing software.

*Example from data*: "This should be fixed for good now starting with SteadyMouse v2.1.1.0. See here for details: https://www.reddit.com/r/steadymouse/comments/5qr104/steadymouse_v2110_is_released/"

## FINDINGS

User support was one of the major codes prevalent in the data. Data that fall into this code mainly were from people other than the product developer who wanted to know how to navigate a problem with the product, get instructions on the usage of the product, or get general tips on how to maximize the product. The product developer's posts and comments also provide explanations and answers to the problems and concerns of users. Many of the data of the study fit into this major code because user support is typical of the operations and implementation of iterative product design. The most frequent data that fell under this major code was Problem Identification, which happens to be one of the sub-codes for this major code. Twenty-seven posts and comments from direct users were labeled with this major code. Twenty-two of the posts and comments from the product developer fell under this code. Eight posts and comments from indirect users were assigned with this code, and two posts and comments from unknown users also were labeled with this code.

## Problem Identification

The most prevailing sub-code was problem identification with a total number of eighteen posts and twelve comments. Twelve posts were from direct users, five from indirect users, and one post from an unknown user. Eight comments came from direct users, two from the developer of SteadyMouse, and one comment each from indirect and unknown users. The most common type of data that fell under this sub-code were questions or inquiries in the form of problems that users of all types encountered while using the product. The excerpt below is an example from a direct user in the data:

> How can I prevent "click-slide"? One of my biggest challenges with my tremor is what I call "click-slide." It's an unintentional movement when I click on an item and it starts to drag instead of just execute. An example is in PowerPoint where I right-click on an object, and instead of seeing the right-click menu, I get "Move Here | Copy Here" options. Another example is when I try to click on a hyperlink, and instead of opening the item, it attempts to copy/drag the link.

This is a post from a direct user who wants to know how to overcome a problem they are facing with the product by explaining what they see happening to their computer when they execute a command and letting the developer know their degree of tremor. One interesting thing I found about the data in this category is that, in order to get their concerns and questions understood by the developer who is not a user of the product, users make their inquiries or report problems they have encountered with the product and also explain to the developer what their bodies are experiencing: for example, their level of tremor. This enables the developer to tailor each solution to their individual needs. An example from the data is:

> How well does it work with a touchpad, particularly an extremely sensitive one? I recently bought the LG Gram 17, a very light 17" screen laptop (poor eyesight accompanies lack of hand control as you age). I've adjusted the sensitivity controls on the touchpad, but I still send the cursor veering off and executing commands I did not intend. Part of the reason is that my tremor is faster ad [sic] lighter than what the adjustments can handle. I'd second the request for a similar product for keyboards. I have used Filter Keys, with the enhancements provided by FilterKeys Setter, but it doesn't seem to help a lot. If you do develop such a product, one suggestion would be to have a key that temporarily disengages the program, as there are times when I do want the key to be repeated fast. Any thoughts on how I might tweak SM to fix this?

Some designers may not have the resources to go out there to target users, talk to them, and ask them what they need because doing so is expensive (Nielsen, 1994). I argue that, for products like SteadyMouse, designers can first create the product and let the users report their problems. When designers engage in this, they reduce the costs involved in recruiting users or people who would be users of the product. User reports/reddit posts stand in for dedicated ethnographic research, which is expensive and requires upfront funding if the designer has not even designed the product yet. Most designers do not have the money to involve users of products at the beginning of the design process, and this brings in social justice implications questions like: Who's more likely to get venture capital funding for products that don't yet exist? Who's

more likely to be considered target users who are promising enough as consumers to prioritize investor money toward designs?

## Recommendation

The total number of comments and posts assigned to the recommendation sub-code were 18 and three, respectively. The software developer posted 12 posts under the recommendation sub-code; eight were from direct users and one from an indirect user. The most common type of messages were ones from the developer of the software that directs or recommends features that users can adjust to make the software perform well. Below is an example of a comment from the developer in the data:

> The free version 1.3 is pretty old now, over 14 years in fact, and a lot of the modern developments were not envisioned back then. The latest version, v2.8.5.0 should handle both your resolution and the high mouse DPI needs just fine. It is designed for this. If you encounter any issues at all please report back here or by email, and I will get it taken care of. FYI: You will want to check out the hidden settings described here. There are several hidden "filter sets" designed specifically for HiDPI high sample rate activity. Lastly, as a backstop to all of this, there is an easy refund policy during the first 70 days.

The excerpt above exemplifies how the developer of the product interacts with users to ensure the software works for them the way it should. It can also be seen from the example that the developer encourages users to report back if the recommendations provided (or given) do not solve the problem. This gesture or step the developer takes portrays how designers can engage with users to design products that meet their needs. A typical UCD practice will include designers reaching out to users first to inquire about their needs for a particular product in the ideation stage; however, this process sometimes requires resources, and designers operating on a small scale cannot go this route. A designer or developer who does not have the resources and would want to create products for marginalized groups such as people with disabilities can rely on one user (in this case, the grandfather of the developer of steadyMouse) to first create the product and then give it to other users to use so they can report back with feedback that can inform updates and redesign (Breuch, 2018).

Below is a post from a direct user that was assigned the recommendation sub-code:

> This works for dialog boxes. I'll have to play with objects in PowerPoint and SnagIt. Parkinson's for me is about more than tremor. It's also rigidity, weakness, and bradykinesia (poverty of movement). Better "snapping" to objects and larger click areas help. Now Microsoft and others are making scroll bars narrower which is a total pain! Someone could make a dime or two off hardware that addresses these issues.

The first example above is from the designer recommending settings to users, whereas this example is from a direct user about what they experience with the product and their recommendation. Users' needs must be prioritized in product design, and the needs of users can vary to include aspects such as how their bodies respond to technologies. However, users are only able to tell this after they have used the product. In other words, when products are designed for bodies that operate differently from assumptions made by mainstream technology designers, then it's especially important to have real users engaging with real products. The reddit thread allows for some of that same feedback as the traditional UCD process, especially when users share information that is specific to the ways their bodies operate.

## Tips

The tips sub-code had eight comments and a post from the developer of steadyMouse. This sub-code was the least prevalent in the user support primary code. The data within this sub-code were always comments from the developer, which were replies to users about a problem. The strategy of providing feedback and after-market support is essential for iterative product design. In this case, the designer of SteadyMouse prioritized the problems, technical glitches, and user feedback to satisfy users' needs. Most people who engage in traditional design processes will strive to meet users' needs and may not return to the same users to inquire about how they find the product after it has been released into the market. However, in utilizing social media to solicit feedback to engage in iterative design, in the case of SteadyMouse, the designer is present at all stages of the design process and the usage stage. An example from the data is below.

> Happily, touch pads are well supported. https://www.steadymouse.com/manual/#mousehardware. Something for keyboards is on the radar, however it is definitely a different problem set requiring innovation. I appreciate your thoughts.

The example from the data shows how the developer of SteadyMouse puts in work by responding and directing users to where they can find information about the software and navigate it.

# IMPLICATIONS

These findings suggest types of information in user feedback that are particularly valuable for informing product design efforts: product-relevant literacy feedback (technological literacy & embodied literacy), usage scenario feedback, and prioritization. Below, I elaborate on these implications.

## Product-Relevant Literacy Feedback

Product-relevant literacy is the knowledge of a particular product that users possess that helps them give feedback that is particularly useful for product design and redesign. IDEO (n.d) outlined strategies designers can use to engage in the design of products that specifically draw out product-relevant literacy. One of the strategies is that it is good to identify individuals who are extremely familiar with a product and ask them about their experiences using the product. The reason for this is that individuals with knowledge of particular products are able to highlight key problems with the design and suggest improvements to the design. In the case of SteadyMouse, the literacy of technologies such as AutoCAD software, Microsoft, the mouse type, and the operating system help users give valuable feedback on the design of SteadyMouse, given that SteadyMouse directly interacts with these third-party technologies.

Designers should think inclusively and broadly about what constitutes product-relevant knowledge. In the case of SteadyMouse, that knowledge includes technological literacy—a type of knowledge that is widely recognized and valued in technical communication, as well as embodied literacy, a type of knowledge that has been overlooked and undervalued, especially regarding disabled bodies (unruly bodies). Davis (2002) has forwarded the term "unruly" to highlight how disabled bodies and identities resist or do not conform to traditional, normative expectations.

This unruliness challenges the rigid structures of normalcy and ableism, questioning what it means to be "normal" or "fit" within societal standards. This research demonstrates that both literacies are important for providing valuable user feedback in the case of SteadyMouse. I explain these two types of feedback in product-relevant literacy below.

## *Technological literacy*

Technological knowledge from users can help designers and developers to better design and fit users' needs. The International Technology Educational Association (2006) defined technological literacy as "the ability to use, manage, evaluate, and understand technology" (p. 4). I argue that in the case of SteadyMouse, knowing the operating system and version of the software one is using are relevant details for troubleshooting product problems. To make valuable comments, users need some level of technological literacy. From the data, users with technological literacy help explain the software problem to the designer of SteadyMouse to develop a solution. For example, let's say I bake wheat bread, and it didn't turn out well. Then I remembered one of my friends is very good at baking, especially bread. If I reach out to my friend and tell her I tried baking wheat bread, but it didn't come out well, my friend might not be able to know what exactly happened. But if I tell her what I did, for example, the quantity of flour, the type of flour, quantity of yeast, and baking powder I used, and also how the bread looks or where I think the problem might be coming from, like probably the bread did not rise, how the bread tastes or just explaining the whole process to her will help my friend determine what went wrong and give me solutions to rectify it the next time I am baking bread. Relating this example to product design, the idea is that if designers understand the technological context in detail, they will be more likely to understand the problem and figure out how to suggest or develop a solution. Users without technological literacy may engage in embodied literacy to give their feedback to designers (which will be discussed in detail later in this section).

Designers or developers can, therefore, rely on users' technological literacies to directly improve the design because it takes users with technological literacies to act as teammates or co-designers. For example, the direct user quoted below identifies the specific software and keys they use when reporting a problem with SteadyMouse to the designer:

> Shift Right Click My main productivity program is Autocad Civil 3d. I am an old school user who lives & dies off of Shift Right Click. Before steadymouse, I would continue to press the shift key after the shift right click. Now with Steadymouse, I need to lift off the shift key because it slows down my mouse movements considerably. Is there a way to shift that function to another key (not control or alt either)? In fact, with my mouse (Corsair m65), I have the "sniper" button to slow down the mouse..can the shift button be redirected to the sniper button? Thanks.

The direct user with the technological knowledge could explain and point to areas they have a problem with and help the developer diagnose the problem and find solutions. Specifically, this direct user tells the designer the software program they are using, which is AutoCAD Civil 3d, and the kind of mouse, which is Corsair m65. This implication aligns with Breuch (2018), who argued that "social media assumes privilege with technological literacy and access" (p. 19). In other words, using social media requires a degree of technological literacy; this literacy helps users relay feedback to the designer of SteadyMouse. Some other studies have found that feedback is integral to the UCD process (Kornfield et al., 2022; Siebehandl et al., 2013). Siebehandl et al. (2013) asserted that "design approaches and solutions should be presented to the future end users to generate feedback and the results fed back into the design process" (p. 140). Though the findings Siebehandl et al. (2013) forwarded do not explicitly say that users must be technologically savvy to give feedback that will inform redesigning and remodeling of software, we can deduce that having technological literacy helps users to explain the situation better and give feedback to the designer to incorporate into the existing software in the case of SteadyMouse. My analysis of technological literacy as an important factor in improving product design is not tied to the old school technical communication where people with technological knowledge were over-valued and seen as experts and undervalued people with other kinds of knowledge (people with other knowledge were seen as "non-experts"). Users without technological literacy may engage in embodied literacy to give their feedback to designers.

## *Embodied literacy*

The findings show that embodied literacy was valuable for informing iterative product design, especially for the product at the heart of this study. That is because this product is designed to accommodate existing technology to a wider range of human bodies; therefore, user feedback that describes how users' bodies respond to a product will be valuable to iterative design. Designers should, therefore, find a way to encourage user comments that include information about embodiment in the design process. According to Swacha (2018), embodied literacy is the "ability to understand how bodies and embodied experiences affect and are affected by how users interact with technologies and texts in varied physical, material ways" (p. 261). Embodied literacy is very helpful when designing products for people with disabilities because designers get to understand users' lived experiences and how their bodies interact with technology. Marginalized users, such as users with disabilities, may not be able to determine how their bodies will react to a technology until they use it. There is, therefore, a need for the designer to design for them and with them by soliciting feedback on the already existing design to improve it. Designers and developers with limited resources may find this process an excellent way to involve users with disabilities in the product design process. Previously discussed in the findings section, this quote from a direct user further illustrates embodied literacy:

> Parkinson's for me is about more than tremor. It's also rigidity, weakness, and bradykinesia (poverty of movement). Better "snapping" to objects and larger click areas help. Now Microsoft and others are making scroll bars narrower which is a total pain!

The user wants the designer to know their Parkinson's goes beyond just the tremor in the hands, they also experience weakness and rigidity, and poor movement. Inferring from this data above, the direct user experience will enable the SteadyMouse designer to know how this user's body works and how it interacts with the product as currently designed. This knowledge is very valuable for informing design modifications that could better suit the product to bodies like this user.

## Usage Scenarios Feedback

Usage scenarios were found to be specific kinds of information that may be helpful to designers in the design process. Just as in the analogy of baking bread I used above, describing how you use the product and the problems you run into will help the designer in the design process. Hartson and Pyla (2019) defined usage scenarios as a "description of a way someone uses an existing product or system" (p. 182). From the data, users narrate the problem they are encountering to the designer. They explain in detail what exactly the problem is so the designer can find solutions to the problem. In short, usage scenarios help designers understand users' situations, problems, and concerns better. Sometimes, usage scenarios may also take the form of embodied and technological literacy for designers to understand the problem the user is encountering and develop a solution for it. For example, from the data a direct user questions:

> Is Shadow plus sign an expected issue. When I move the mouse with SteadyMouse enabled, I see a shadow plus sign usually ahead or behind the cursor. It's slightly distracting and sometimes I click on the wrong spot because the plus sign is over the target. I even see it in the video on the home page. Running Windows 10 with latest steadymouse 2.8.2.0. Is this expected and unavoidable?

In this example, the user provides a detailed description of their problem by specifying what they see when they use their computer mouse, the operating system they are using, and the version of SteadyMouse. The mention of a "shadow plus sign" that appears ahead of or behind the cursor, causing distractions and leading to misclicks, is a clear depiction of a real-world problem that directly impacts the user experience of the product. This usage scenario offers context that is crucial for the designer to understand the nature of the problem.

This feedback exemplifies a usage scenario because it goes beyond merely reporting a bug—it provides a narrative that connects the user's experience with the product to the underlying design challenge. Such scenarios are vital for designers as they reveal how a product performs in actual environments, where unexpected issues like the one described may arise. By analyzing usage scenarios, designers can gain a deeper understanding of users' problems, enabling them to make informed decisions in the design process and ultimately improve product usability.

Swacha (2018) asserted that embodied literacy should be taught as an important skill in technical communication. I believe users can help designers in the design process if they communicate their embodied experiences to them. I posit that designers may only get this information from users themselves, especially users with disabilities after they have used a product. In sharing this private yet important information, users become vulnerable to designers.

In the traditional UCD design process, where designers work together with users from their product conception stage, information about embodied literacy may be hard to source considering how private information of this kind is; however, in the case of SteadyMouse, the designer's act of kindness and respect towards users as well as his presence throughout the whole process as seen in the way he responded to users' posts and questions appears to have made users feel safe enough to share such vital information. It is often only after a user engages with a product in the actual usage environment that specific design problems come to light.

Therefore, for embodied literacy to be fully disclosed and effectively addressed, designers must prioritize building strong relationships with users of their products. This relationship can help foster the trust and openness necessary for users to give feedback containing embodied experiences.

## Prioritization

Users are the best judge of what is a big problem and what is not. With that information, users can help designers prioritize their needs. Sometimes, a designer cannot fix everything in the product design stage. Instead, they rely on users' feedback to improve product design after a product is released. How can designers decide what to spend their time fixing or changing? I assert that designers can prioritize the problems that users mention most frequently. Apart from this, since some designers cannot fix or change everything because of a lack of resources, prioritization will help designers pick problems and concerns that users post more about. This was evident in most of the designer-user interaction on the SteadyMouse reddit forum. Prioritization, therefore, shows the importance of humility by developers, the importance of iterative problem-solving, and the importance of partnering with users. This implication aligns with Johnson-Eilola (2009), who argued that technical communicators and educators can move into a post-industrial model of work that prioritizes information and communication, with benefits to both technical communicators and users.

However, while prioritizing frequent topics is important, it is also worth considering outlier posts—those that may not be as commonly discussed but could point to unique or critical issues that are less visible. These outlier posts might reveal problems that, if addressed, could significantly enhance the user experience for specific groups; for instance, users on the forum acknowledged their different kinds of Parkinson's. A user might encounter an issue that is very specific to their Parkinson's and might only be experienced by them. By not overlooking the outlier posts, designers can ensure product improvement that balances the most common concerns with the unique challenges that might otherwise go unnoticed.

# CONCLUSION

Social media feedback may be helpful in improving the design of products. In this paper, I identified specific kinds of information from users on social media that may help designers with product improvement. The specific kinds of information include product-relevant literacy feedback (technology literacy and embodied literacy), usage scenario feedback, and prioritization. These implications can inform and guide designers and developers on the kind of information that will be useful for iterative design to improve their products. From the implications of this study, designers and developers can ask users about these kinds of valuable information (embodied literacy and technological literacy) upfront. If developers know about this, they could include prompts or instructions for where to find relevant technology information or questions related to embodied literacy for users. Including a space for these kinds of literacies to be shared could be relevant to users feeling comfortable posting private details of how their bodies work in a secured online space.

Although I presented relevant information in this paper, I am not by any means saying the findings and implications in this article are the only valuable information that can help in improving design feedback from users for iterative design. Therefore, future research could explore more ways designers and developers can solicit user

feedback that can potentially improve product design. Also, this study found that embodied literacy can be key in user feedback, especially when the specific ways that bodies function are centrally relevant to the design of a product. Future studies can be conducted on how this kind of information can be collected from users since this information is considered personal and private.

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# Designing Social Media Learning Environments to Promote Digital Literacy

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## ABSTRACT

This article considers how *learning environment design* can help TPC instructors using social media tools in their courses to better support students' practicing of digital literacy. Based on findings from an IRB-approved qualitative study of a social media pedagogy that makes use of the platform Slack, this article contributes insight into how learning environment design in social media learning communities can assist instructors hoping to support their students as they practice digital and social media literacy activities.

## CCS Concepts

Social and professional topics → Professional topics → Computing education → **Computing literacy**

Applied computing → Education → **Interactive learning environments**

## Keywords

online learning, social media, pedagogy, digital literacy, learning environment design

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## INTRODUCTION

In the wake of many universities transitioning to fully online or hybrid teaching formats in response to the COVID-19 pandemic, many instructors began to experiment with social media pedagogies that made use of platforms like Discord, Slack, or Facebook as social learning tools in their courses. The onset of the COVID-19 pandemic exacerbated a trend that had been building for decades: instructors across disciplines, including in technical and professional communication (TPC), began supplementing their standard course curricula with a social media component, oftentimes in an online discussion or message board format (Conner & Webb, 2021; Daer & Potts, 2014; Day, McClure, & Palmquist, 2010; Johnson & Salter, 2022; Kole de Peralta & Robey, 2018; Sano-Franchini et al., 2022; Vie, 2008; Vie, 2017). Social media pedagogies hold great promise for assisting learning: they can help students to form communities through informal discussion (Johnson & Salter, 2022), can improve traditional writing abilities (Mina, 2017), and can support critical thinking (Coad, 2013). Other research has found participation on Facebook can help writers enact interdiscursive and intertextual writing (Amicucci, 2020), can enable social justice work (Maraj, 2020; Sano-Franchini et al., 2022), and can help develop students' critical digital literacies (Vie, 2008). Furthermore, in *Writing on the Social Network*, Buck (2023) offered varied literacy activities, such as managing multiple competing audiences, self-presentation, self-promotion, and management of personal data, that participation on social media platforms encourages users to develop (p. 19).

As such, a wealth of research exists on why instructors should consider social media tools in their pedagogies as well as what sorts of student learning those pedagogies can support. However, as instructors and students began the process of transitioning to pedagogies mediated far more by digital technologies than most had been accustomed to in the wake of COVID-19, many felt unprepared and unsupported, finding that the social media learning communities they'd designed for their courses didn't serve the needs of their classrooms and their students as well as they could. Research in fields like psychology (Khan et al., 2021) has shown that social media tools have increasingly helped students engage

in collaborative learning activities during the COVID pandemic, which TPC research (Sano-Franchini et al., 2022) has recalled necessitates a shifting to "online writing instruction (OWI) on a macro level" (p. 135). While "just getting by" understandably seemed more than good enough for many instructors in the Spring of 2020, many instructors expressed an intent to improve their students' experiences with social media pedagogies moving forward in subsequent semesters.

This article responds to this exigence within university pedagogies by considering the role of design in the construction of social media learning environments embedded within college courses. Examining the role of *learning environment design* in social media pedagogies, this article considers how informed designing of learning environments can enable social interactions among students that can support the practicing (and learning) of digital and social media literacies. Drawing on an IRB-approved qualitative study involving the platform Slack, this article offers insight into learning environment design within social media pedagogies to better support the practicing of digital and social media literacies.

## LEARNING ENVIRONMENT DESIGN

Insights relating to learning environment design with social media are of value across the curriculum. However, the abilities of learning environment design to support the development of digital literacy skills is particularly important in technical and professional communication. As competence with digital and social media literacy skills remains vital to students' academic and professional futures, the ability of TPC pedagogies to support these vital skills in a multitude of ways remains a key competence for educators to orient their learning environment designs toward, especially when teaching in online or hybrid courses (e.g., Bridgeford, 2020; Brumberger & Lauer, 2015; Frith, 2014; Getto, Labriola, & Ruszkiewicz, 2020; Lauer & Brumberger, 2019; Spilka, 2010). Contemporary technical communicators work multimodally through video tutorials (Alexander, 2013; Mogull, 202; Morain & Swarts, 2012), generate informative data visualizations (Lindgren, 2021; Verhulsdonck & Shah, 2021), use social media to inform and educate the public (Graham, 2021; Koerber, 2021; Potts, 2013), leverage translation skills with Google Translate to assist marginalized communities (Gonzales, 2018), and work in online forums to assist with user help documentation and moderation (Frith, 2014; Gallagher, 2018; Pflugfelder, 2017; Swarts, 2015a; 2015b). Such a wide array of digital literacy practices showcases the broad utility of digital literacy capabilities that contemporary communicators require, posing an exigence that social media pedagogies can contribute toward developing, especially when scaffolded with other opportunities to practice digital literacies.

Critical consideration of learning environment design with social media, and its abilities to support digital literacy practices in TPC courses, remains a key opportunity for instructors in TPC and beyond to help students learn to communicate digitally in effective ways for the audiences, contexts, media, and rhetorical situations that contemporary communicators navigate. Lizzio, Wilson, and Simons (2002) have suggested that learning environments include "teaching methods, workload, course structure," and other "situational factors" that also could include technologies, interpersonal dynamics, content topics, instructors, and social media software in the case of a social media pedagogy, where elements like the interface, platform affordances, hyperlinking, and digital identity construction come into play (p. 28). Moreover, considering learning environment design in TPC curricula that engage social media offers a chance to enact what Costanza-Chock (2020) has considered the speculative possibilities of design, as design "is about envisioning, as well as manipulating, the future" as well as proposing, predicting, and advocating for possible "visions of the future" (p. 15). Defining design as "a way of thinking, learning, and engaging with the world," Costanza-Chock emphasized that "reasoning through design is a mode of knowledge production that is neither primarily deductive nor inductive, but rather abductive and speculative" (p. 15). Thus, learning environment design can help TPC instructors to envision possible futures for the imagination, setup, material realities, and social interactions of a given learning environment, manipulating their material and social realities to optimize future learning situations through careful attention to how those situations are designed. Moreover, while teaching online and in the semesters following the outbreak of COVID-19, the operative question for many instructors evolved from "should I use social media tools like Discord or Slack in my course?" to "how do I optimize or maximize the success of my course's social media pedagogy?" The latter is a question that consideration of learning environment design is well-equipped to respond. Drawing on Costanza-Chock's conception of design, I approach *learning environment design* as the imaginative manipulation of social, material, interpersonal, and technological factors within a learning situation in a form that proposes, predicts, and advocates for optimization of those factors in future learning environments.

The design of learning environments has long been of interest to educators, including in the fields of technical and professional communication and rhetoric and composition. Sackey, Nguyen, & Grabill (2015) have examined how digital learning environments can work rhetorically and discursively through "deliberate facilitation strategies" to encourage student learning, especially in online course designs (p. 112). They shared that their online-based learning environment designs "focused on using particular facilitation styles to create a learning environment" and provided students with "an easy platform to share and connect with others and interrogate their pre-existing knowledge, which ultimately led to moments of change (or learning moments)" (p. 115). Indeed, Sackey, Nguyen, & Grabill argued that "practices within a space help to design an experience" of learning and pointed toward the convergence of varied contributors such as technology, platforms, physical location, course tone, student cultures, and instructor priorities as major factors contributing to learning environment design in online spaces (p. 116). In other words, online learning environment design consists of far more than just the technology or platform that a course uses (including Learning Management Systems), but rather arises from the convergence of tools, practices, cultures, and humans that contribute to the learning community. As a result, research on social media pedagogies, combined with Sackey, Nguyen, & Grabill's (2015) focus on multifaceted learning environments and Costanza-Chock's (2020) approach to design, sets a foundation that orients learning environment design toward a learning goal of particular interest to TPC instructors: digital literacy.

Considering the varied, diverse, and nearly ubiquitous ways that contemporary students use digital writing and composing software (e.g., Amicucci, 2017; Buck, 2012; Moore et al., 2016; Robinson et al., 2019; Rodrigo & Romberger, 2017), digital literacy is perhaps more impactful in the social, cultural, and political activities of the

world than it ever has been before. Eyman (2015), for instance, has defined digital literacy as requiring a person to "be able to read and write with a number of sign systems (e.g., coded web pages, video, audio, image, animation), each of which has its own functional and critical requirements" (p. 45). Moreover, Spilka (2010) defined digital literacy as

> theory and practice that focus[es] on use of digital technology, including the ability to read, write, and communicate using digital technology, the ability to think critically about digital technology, and consideration of social, cultural, political, and educational values associated with those activities. (p. 8).

Similarly, research in composition studies and in digital rhetoric has shown that social media can be an effective learning mechanism for teaching, experimenting, and generating digital literacy skills. Vie (2008) discussed "critical digital literacies" and the importance of being able to "effectively integrate technological literacy instruction," as "we are increasingly asking students to assess, evaluate, and create multimedia texts in composition classes" (pp. 9, 14). Both Selber (2004) and the New London Group (1996) have stressed the imperative of helping students develop "multiliteracies," which in a contemporary context would necessarily include both digital and social media literacies. For Selber (2004), literacy activities that involve digital tools must be informed by functional, critical, and rhetorical capacities as well as by an ability to not only use technology, but to be "questioners of technology" and "producers of technology" (p. 25). Thus, digital literacy consists not only of an ability to use digital tools, but also an ability to consider their aptitudes and constraints, their functionalities across different contexts, their implicit and explicit ideologies, and their capacities to succeed and fall short of particular rhetorical goals.

Furthermore, digital literacy includes an important component—social media literacies—that scholars like Yancey (2009), Vie (2008), and Buck (2023) have argued are important to participation in 21st century culture. Mina (2017) argued that social media composing environments can help students to practice "critical literacy," including through examination of worldviews, beliefs, practices, critiques, and challenges (272). Following Mina (2017), in this article, I approach social media literacies as a component of a larger category of digital literacy that is focused on social media platforms in particular, representing an individual's ability to participate, share, contribute, and critically consider literacies exercised on social media in relation to related literacies, worldviews, beliefs, and practices. Thus, social media literacies function within a broader understanding of digital literacy that foregrounds attention to the distinct literacy practices and habits that are common to social media environments such as commenting on original posts, calibrating writing for a networked audience, tagging others, using hashtags, and mixing multiple media like digital writing, images, links, emojis, and video into a single post. Additionally, I understand social media pedagogies to represent classroom initiatives that oftentimes support development of digital and social media literacies through immersion in use of social media tools, such as the particular approach outlined in the next section.

## PEDAGOGY & PLATFORM

The technology-course-culture convergence that contributes to the design of online social learning environments is a vital consideration for instructors. In this article, I draw on a qualitative study built from a social media learning community that uses the platform Slack to support student interaction, participatory action, and collaborative learning. In this pedagogy, Slack serves as a non-neutral vehicle that facilitates a participatory pedagogy in which students participate partially on their own terms, contributing a self-selected and self-defined contribution within set instructor-defined parameters for participation. Platform choice is an important consideration in learning environment design involving social media, as an instructor likely cannot create their own software platform for pedagogical use. This means that an essential component of the learning environment design occurs within the confines of a digital interface the instructor has limited agency over once a platform choice has been made. For this reason, classroom discussions occurring in Learning Management Systems (LMS) certainly can be considered social media pedagogies even if they oftentimes represent only marginally effective ones that tend not to support authentic social interactions, true human connections, or student-to-student bonds. However, instructors do have agency over the pedagogy that social media tools support and the pedagogy has as much (if not more) influence on a learning environment compared to the platform.

The pedagogy used in this study asks students to contribute to the course's Slack learning community once each week, ending their contribution with a question for the learning community and then responding to two other participants' posts as well as two comments on their own post. Importantly, though, students aren't just writing in Slack about the course. Instead, they contribute with a participatory action that is drawn from practices and logics that are organic to social media communication environments using what the pedagogy refers to as "Modes of Participation." These modes of participation"—#Like #Share, #Teach, #Crowdsource, #Make, #Link, #Draw, #Moderate, and #Connect—attempt to leverage some of the practices and logics common in social media environments for social learning, student-to-student horizontal bond formation, and learning ecology formation. Each week, students participate in the Slack channel with a contribution to the learning community related to course topics that is meaningful to them, leverages practices of social media for learning, and extends beyond the scope of what a top-down vertical "sage on the stage" learning environment design can provide. For their participation each week, students write six sentences using a "Mode of Participation" (for instance, using #Teach to teach classmates about how a nature documentary uses pathos to make an appeal about climate change or using #Share to connect their actions creating recruitment posters for an on-campus club to course discussions about making effective arguments). The students might even #Connect another student's prior post to some new topic, #Make a short video on their smartphone outlining their forthcoming project topic and thesis, or #Respond to a discussion on revision in the writing process from a prior in-person class session. They then respond to two other students' posts and respond to two comments on their own post, tagging, liking, linking, and responding with emoji reactions along the way. The next week they repeat the process with a different "Mode of Participation." I provided about 20 "Modes of Participation" for students to use as heuristics, but students are also free to make up their own.

Slack and this accompanying pedagogy support insular networks of sharing, linking, composing, and writing that are geared more for engagement within known networks around shared themes, interests, and topics of discussion rather than attempting outreach into publics beyond the course or classroom. In technical and professional communication, social media pedagogies have been mobilized to advocate for social justice causes (Warren-Riley, 2018), help students enact public social media literacy practices (Daer & Potts, 2014), teach graduate students how to use social media in their own teaching of technical communication (Vie, 2017), and help students consider connections between learning platforms and the cultural ecosystems they exist in (Johnson & Salter, 2022). The goals of the social media pedagogy outlined here are a bit different, however, as this pedagogy can be considered "inward facing" in that it makes use of an enclosed, non-public Slack social media learning environment in comparison to other "outward-facing" public (or semi-public) social media pedagogies like those offered by Warren-Riley (2018), Daer and Potts (2014), and Vie (2017). In this sense, "walled garden"-type social networks supported by platforms like Slack (or similar platforms such as Discord) prioritize student-to-student horizontal bond development and relationship building rather than composing for large public audiences, which a pedagogy oriented around platforms like Facebook might be more equipped for (see Maratano & Barton, 2010). Platforms that support "walled gardens" can help students be more intentional and aware of their interactions with others and can lessen the risk of digital aggression, protecting students from interactions with potentially hostile publics within a learning environment. They also adhere to definitions of social networking sites provided by Ellison and Boyd (2013), as they are

> a *networked communication platform* in which participants 1) have *uniquely identifiable profiles* that consist of user-supplied content, content provided by other users, and/or system-level data; 2) can *publicly articulate connections* that can be viewed and traversed by others; and 3) can consume, produce, and/or interact with *streams of user-generated content* provided by their connections on the site. (p. 159)

As competence with digital and social media literacies remains vital to students' academic and professional futures, the ability of online learning environments to support these vital skills in a multitude of ways remains a key competency for educators in TPC and beyond to orient their learning environment designs toward. Social media pedagogies, especially those that pay careful attention to learning environment design, have potential to support the learning and practicing of digital and social media literacies, as the study outlined in the next section demonstrates.

## METHODS

In the Fall semester of 2021, I conducted an IRB-approved qualitative case study (#2021-0344) with grounded theory elements that examined, in part, how social media learning environments can support digital and social media literacy development. This qualitative case study used a modified grounded theory approach that featured both emergent and a priori conceptual categories (Charmaz, 2014; Glaser & Strauss, 1967). The goal of the study was to build a theory concerning how students participate and invent in social media environments, providing insight into how instructors can tailor their pedagogies to better serve these networked writing practices to make them more fruitful and generative, including for supporting digital and social media literacy activities.

The study investigated three research questions. The primary research question that the study investigated was:

1. How do student composers invent within networked social media environments?

Additionally, the study examined additional research questions of:

2. How can social media pedagogy initiatives cultivate the formation of learning ecologies, rhetorical invention, digital literacy, and distributed expertise?
3. What can this study tell us about potential "best practices" for social media pedagogies?

In the first research question, I used the term "invent" instead of "write" or "create" to refer to rhetorical invention that might use many or multiple forms of media to communicate, such as when someone linked a YouTube video to their original paragraph or attached a meme, drawing, or image to their writing. The study design involved modifying traditional grounded theory approaches to incorporate *a priori* categories (such as "Digital Literacy") that I knew from previous experiences I wanted to learn more about while keeping it as emergent as possible, because this category was supported by a variety of codes that emerged organically in the collected data. In short, I knew from previous experiences using Slack in my courses that digital literacy activities occurred, but I wanted to know exactly what students were doing, how those activities were happening, what students thought of their digital literacy experiences in Slack, and what common experiences were shared across the Slack network related to digital and social media literacies. Though I began the study knowing I wanted to examine four a priori conceptual categories ("Digital Literacy," "Learning Ecology Formation," "Distributed Expertise," and "Rhetorical Invention"), I was continually open to their revision, evolution, transformation, and adjustment based on the emerging data and evidence that emerged as the study progressed.

While beginning a qualitative study with *a priori* categories based on previous experiences introduces potential for researcher bias, it would be arguably more dishonest for a researcher to pretend that previous conceptions of the study topic and anticipations of potential findings do not exist. Unlike some other approaches to qualitative research, Charmaz (2006) assumed that "neither data nor theories are discovered" (p. 10). Instead, Charmaz's social-constructivist approach to grounded theory insisted that a qualitative grounded theory study is a "construction-yours" (xi) in which "we are part of the world we study and the data we collect… we construct our grounded theories through our past and present involvements and interactions with people, perspectives, and research practices" (p. 10). Thus, I decided to pursue these a priori categories in the study to learn more about them and to learn if or how data supports them while also doing my absolute best to keep these categories as emergent as possible based on the contributing data and codes. In some ways, *a priori* categories contribute to a theoretical sampling procedure where a researcher explores leads, follows hunches, examines patterns, and continually gathers data to saturate categories (p. 96). For Charmaz, "engaging in theoretical sampling prompts you to predict where and how you can find needed data to fill gaps and to saturate categories," allowing researchers to follow "hunches about where to find data that will illuminate these categories" (p. 103). As I had experimented with

similar social media pedagogies for about three years before this study and had fine-tuned my pedagogical practices over time to support desired student learning outcomes, I decided to feature a priori categories in the study while doing my best to minimize bias. Across the duration of the study, I remained open to these categories not being supported by the data, evolving, changing in definition, or appearing in unexpected forms based on emergent codes and the supporting data.

In fact, evolution of an *a priori* category occurred about halfway through the course of data collection. In November of 2021, I noticed that the *a priori* category I began the study with, which I called "Digital Literacy," was composed heavily of codes and supporting data relating to social media literacy activities. To reflect this change in the developing conceptual category, and to better encapsulate the emerging data, I changed the category title to "Digital and Social Media Literacies." In this way, I was able to investigate and learn more about a topic of interest (digital literacy) while also allowing the actual data that was collected (and its resulting codes) to determine what the category was titled and how it was organized.

## Data Collection: Slack Posts, Entries in Reflective Journals, & Interviews with Students

Data in this study was collected in two in-person First Year Composition courses at a competitive R1 research university in the American Southeast from mostly first year students enrolled in a variety of STEM, humanities, and other majors. Only students enrolled in the author's two First Year Composition courses in Fall 2021 were eligible to participate. Early in the semester, I introduced the study and its goals, procedures, research questions, and ethical considerations. As part of informed consent procedures based on IRB guidelines and the "CCCC Guidelines for the Ethical Conduct of Research in Composition Studies" (2018) document, I then fielded questions from students, provided my email information for questions they might develop later, and explained that participants were able to withdraw from the study at any point with no explanations required. I provided students with an informed consent document and allowed them time to interrogate it, question it, and to consider the benefits and risks of participation. I also communicated to students that there would be no repercussions for not participating, for participating partially (say, though not wanting to participate in an interview with me), or for the content of their participation in the study. I took as much care as I could to communicate benefits (there would be none, aside from possibly improving future classroom experiences for future students) alongside potential risks. I clarified multiple times that participation was in no way required for success in the course. At this point, I felt I had done as much as I could to ensure the study was as ethical, fair, transparent, and in line with disciplinary best practices as it could be.

After introducing the study, 22 out of 42 students eventually consented to participate, with 9 of them agreeing to speak in a one-on-one interview on Zoom. While data for this study was collected in a First Year Composition course, the social interaction and engagement are learning practices shared with similar pedagogies across college curricula as well as in technical and professional communication courses that the author has taught. In this way, the study's findings have relevance and utility beyond composition courses alone, offering instructors with interest in promoting digital literacy a roadmap for effective learning environment design using social media.

The study involved three forms of data collection obtained through human subjects research: (a) Collection of Slack posts and interactions across the semester, (b) Collection of reflective journal entries written by students that documented their experiences with the social media pedagogy, and (c) Collection of interview data from student participants (I conducted 9 Zoom interviews in Fall 2021).

### *Slack Posts & Interactions*

Beginning in Week 1 of the course, I began collecting data from participating students' writing, participation, sharing, and interactions on Slack, copying any writing into a Google Doc and screenshotting each post to capture available context and multimedia. In this study, I understood the term "interaction" to refer to any visible social activity that a participant engaged in on the Slack channel that included other study participants. This included students writing or sharing an original post, but also commenting on others' posts, responding to comments on their own posts, tagging others in either a post or a comment, liking or reacting to the writing of others, or referring in Slack participation to in-class work or activities. As outlined above, students wrote six sentences each week (or the equivalent in multimedia) using one of the "Modes of Participation" such as #Teach, #Share, #Crowdsource, or #Meme before ending their post with a question. They then responded to two other students' posts and to two comments on their own post, commonly using multimedia such as linked images and websites, memes, videos, and occasionally drawings in their Slack participation to do so. I only collected Slack participation data in which all involved students consented to participate in the study, so any comments from non-participating students were disregarded. I gathered this data once a week after students had participated in Slack, with the only exceptions occurring when students participated beyond the course's stated deadlines and I collected the data later than usual.

### *Entries in Reflective Journals*

In the 6th and 14th week of the course (ie. the near-beginning and end of the course), all students enrolled in the course submitted reflective journal entries. In these entries, students reflected on writing alongside others in Slack each week, their social interactions, what they had learned or thought about while on Slack, and answered reflective questions about their writing and media practices. I then read, analyzed, and coded the 3–4 page reflective journal entries from participating students. Illustrative questions that students were prompted to answer in writing included "What sorts of emotions did you feel as you wrote and conversed with others in the networked discussion?," "Did you learn anything through sharing stories, experiences, responses, or reactions in Slack with your peers?," and "How did you take advantage of social media affordances (commenting, liking, tagging, messaging, linking) to learn alongside and with others?"

### *Interviews with Students*

I also conducted 9 interviews with participating students, which took place in 20–30 minute Zoom calls near the end of the semester (November and December) when students had been participating in the Slack learning environment for at least 11 weeks. The questions that I asked students included "Would you describe your typical composing process each week in the Slack network?," "What activities did you engage in that you would consider to be involved

with 'literacy'?," and "Did you engage in participation in Slack beyond writing, such as creating a meme, sharing a link to an outside site, sharing an image or video, recording audio of yourself speaking, or some other means of participating?"

I interviewed students near the end of the semester, which was particularly helpful for fully exploring the study's developing categories, as interview questions allowed me to saturate the categories in line with grounded theory methods. This allowed me to inquire further into data, codes, and categories that appeared in the Slack participation data and the reflective journal entries, learning as much as I could about them and examining as many details, connections, and explanations for particular codes and categories as possible. In-semester interviews, however, introduced an element of bias and potential conflict of interest into the study design, which can be considered a limitation of the study. While I did interview students during the semester, I took great care to clearly convey to students that their responses to interview questions would not impact their grade or level of success in the course and I provided students contact information for the university's Institutional Review Board office in case they felt there was any sort of ethical violation occurring.

## Data Analysis & Coding

By the end of the study in December of 2021, I collected, coded, and analyzed 396 pages of data made up of 146 pages of Slack participation data, 139 pages of Slack Reflective Journal data, and 111 pages of data from student interviews. The coding process for this study involved initial, focused, and theoretical coding stages in the qualitative coding software platform Dedoose. As the study developed, I engaged in an extensive process of memoing and developed a codebook that defined codes, offered example data assigned a particular code, and differentiated between codes. For instance, in the codebook I defined the code "Making a Meme" as "describes a student making a meme as a form of communication or reflecting on once having done so." As an example application of this code, the codebook cites a comment detailing a meme a student had made and posted into the Slack channel that read "#Share My meme is poking fun at how a student might feel when they realized they forgot to add in-text citations as they were writing their essay…." This codebook is also how I differentiated codes with some similarities from one another with definitions and distinct characteristics for how and when each code would be applied.

In initial weeks of data collection, I coded data primarily from Slack participation in Dedoose to look for initial codes in the data. About five weeks into the semester, students in the course submitted a first round of Slack reflective journal entries, which I then coded in Dedoose while engaging in an extensive memoing process that involved constant comparison, theoretical sampling procedures, recursive data analysis, reflective note-taking procedures, and extensive comparison and contrasting between the reflective journal entries and the Slack participation data. Later on, toward the end of the semester, about 12 weeks into the course, I began conducting interviews with 9 consenting students about their Slack participation experiences, which were then coded in relation to Slack participation data and two iterations of reflective journal entries (the second Slack reflective journal entry was turned in about 14 weeks into the course). This coding process occurred at initial, focused, and theoretical levels across all three forms of data collection once they became available, with careful attention being paid to maintain theoretical sampling, constant comparison, and memoing processes.

As previously noted, in a particularly important development in the data analysis process, I began this study with an a priori category of "Digital Literacy." Over the course of data collection, theoretical sampling, and especially data analysis, however, I began to notice an emerging series of codes related to social media literacies that I'd been assigning to the "Digital Literacy" category. After months of examining and coding the data, I resolved to reform and rename the existing "Digital Literacy" category into a hybrid a priori and emergent category of "Digital and Social Media Literacies." I began to suspect that a cluster of codes that I originally had grouped in the "Digital Literacy" conceptual category fit better in their own category centered around "Social Media Literacies." In this study, I approach "Social Media Literacies" as reading, writing, sharing, and participation activities in networked social media environments that can variously involve critical analysis, creative synthesis, information appraisal, multimodal proficiency, and the building of social connections. Digital literacies and social media literacies have much in common, and in some disciplinary and popular forums, social media literacies are subsumed within a larger category of digital literacies. However, within this qualitative case study, the data and codes point toward "Social Media Literacies" and "Digital Literacies" as similar conceptual categories that share many of the same supporting codes drawn from the data. As such, the data led me to cluster these codes together into a reformed, blended, and renamed "Digital and Social Media Literacies" category, which I then incorporated into the theoretical sampling, saturation, memoing, and initial, focused, and theoretical coding processes.

Across the data analysis process, I did my best to limit researcher bias as much as possible while also enacting the "construction yours" (p. xi) element of grounded theory methods offered by Charmaz (2006) in which researchers do not deny their own ideological involvement in a study, but rather are recursively involved in simultaneous data collection and analysis that develop "social and subjective meanings" (p. 7). In grounded theory's foundational text, Glaser and Strauss (1967) wrote that "the researcher can get—and cultivate—crucial insights not only during his research (and from his research) [sic] but from his [sic] own personal experiences prior to or outside it" (p. 252). Thus, I decided against any sort of formal validity measure or interrater reliability process.

# FINDINGS: DESIGNING ENVIRONMENTS FOR DIGITAL LITERACY DEVELOPMENT WITH SOCIAL MEDIA

The study's findings were comprised of six conceptual categories that included "Digital and Social Media Literacies," a hybrid *a priori*-emergent category. The student-provided data forming this category showcases the abilities of social media pedagogies to help students to learn, practice, and enact digital and social media literacies. This occurs primarily through supporting practices of digital writing, encouraging monitoring and critique of platforms, connecting digital and academic writing, practice of multimodal rhetorical invention, rhetorical insight development, social media literacy activity, and intertextual writing.

## Digital & Networked Writing

A number of codes emerged in the data that demonstrate social media pedagogies' abilities to encourage critical and creative practices related to digital and networked writing (see Table

1). Codes like "Discussing Affordances/Challenges of Digital Writing," "Discussing the Internet Writing Process," "Commenting or Critique of Platform/Interface," "Discussing Emotional Experience of Writing in Slack/Writing Online," and "Monitoring Afterlife of a Slack Post" demonstrate the practices that the social media pedagogy encourages relating to digital and internet writing. Digital and internet writing are important components of digital literacy, as participants on the internet compose Tweets, write posts and comments on reddit, send text messages on smartphones, craft online blogs, and perform other writing-based literacy actions online. The Slack pedagogy encouraged many diverse forms and forums for digital writing, with one participant reflecting how "one of the best aspects of Slack is how easy it is to use… I have downloaded the app on my phone, iPad, and laptop, so I am able to write a post from anywhere at any time.".

In the Slack learning community, students commonly discussed the affordances and challenges of digital writing, commenting in some form on what digital writing enables (viral circulation, social connections, and genres not supported in the same way by other media) as well as what it constrains (face-to-face connections, authenticity, and verbal interactions, for instance). Students actively considered digital writing's potentials, aptitudes, and capacities for action as well as the restraints, limits, and problems that can arise compared to writing in other modes. With this "Discussing Affordances/Challenges of Digital Writing" code, students showcased a critical reflective capacity involving connecting digital literacy with analysis of mode, audience, media, genre, culture, writing, and rhetorical action. As a testament to gaining these digital rhetorical capacities, one student wrote in a reflective journal entry:

> I think that my comfortability with Slack has made me a better digital writer… It has helped me bridge the gap between a virtual and physical audience… The use of Slack has allowed me to write in an online place, while still seeing the people I am writing to on a weekly basis.

By exploring and critically examining some of the affordances and constraints entailed with digital and internet writing, students considered how digital writing practices, routines, and habits of mind impact their literacy actions as they interact with social, academic, and cultural communities.

Similarly, the "Discussing the Internet Writing Process" code exhibits the reflective and communicative work that students engaged in involving critical consideration of invention, drafting, editing, revising, circulating, tailoring, and crafting communications in the Slack channel. Reflecting on the internet writing process helps to showcase the particular choices, possibilities, considerations, and challenges as well as differences between students' experiences writing in social media environments compared to academic writing processes. Discussion of the internet writing processes that students have engaged in exhibits digital literacy in action, including a mostly informal assessment on the part of students on how digital writing can be used to achieve particular goals, purposes, and outcomes. Similarly, the "Discussing Emotional Experience of Writing in Slack/Writing Online" code also displays critical reflection on the affective, emotional, and relational nature of online writing (and indeed all writing), including reflection on how emotional and affective group relationships can be generative for social learning and learning of course content. The varied emotional experience of digital writing for and alongside others also helped at least one participant to renew their enjoyment of writing, as they shared:

> I have always enjoyed writing, but sometimes having extensive rules to a paper ruins that love for writing… Slack has allowed me to keep my love of writing by not giving me [many] rules to focus on following, which was extremely beneficial.

## Monitoring & Critique of Platforms

Students also reported following their Slack post's circulation among their peers and the responses of their peers, an important part of digital literacy (see Gallagher, 2020; Gallagher, 2015) that is attested to by the "Monitoring Afterlife of a Slack Post" code. One participant, for instance, wrote in a reflective journal entry:

> Surprisingly, I did find myself monitoring my Slack channel for comments and responses after I wrote them… I would look forward to reading what other people had to say about my posts… sometimes I would feel a little down if I did not get any response to a post I was really proud about.

Students also engaged in extensive critique of digital platforms and interfaces, including the Slack interface as well as platforms and interfaces they used as part of the course or that they encountered in their personal lives.

## Connecting Digital & Academic Writing

Other codes emerged that connect the digital literacy actions students engaged in within the Slack learning community with utility for academic writing processes. Codes such as "Discussing How Slack Writing Transfers/Informs Academic Writing" and "Discussing Slack Helping to Increase Writing Confidence" evidence the ways writing in Slack helped students to both transfer knowledge related to rhetorical situations between academic and internet writing situations as well as to gain confidence in their writing and rhetorical abilities through digital writing activities. In a number of cases, students demonstrated transfer of knowledge from academic to internet writing situations, and vice-versa, and this seemed to trickle over into increases in writing confidence, which was reported in reflective journals and interviews on a number of occasions. Participants reported that their processes of gauging audiences, goals, rhetorical choices, and idea arrangements in writing situations had both much in common and much in disagreement between academic and online writing processes.

## Multimodal Rhetorical Invention

Codes also emerged in this study indicating students engaging in multimodal invention processes that involve invention in media beyond digital writing, including codes such as "Discussing Online Video Creation Process," "Critical Sharing of an Internet Link," "Shares an Image," "Participation with Smartphone/Tablet," "Making a Meme," and "Shares a Video." In their activities posting videos, sharing internet links, creating memes, and engaging in other multimodal work, students showcased critical practices related to digital literacy (see Figure 1). These digital literacy practices and reflective capacities included considering circulation and delivery of messages through digital networks, gauging audience desires and expectations for digital writing, and engaging in multimodal rhetorical invention with visual, sonic, and other media (see Richter, 2023). One student wrote about having "used hashtags in my Slack writing…" as "a way to categorize my

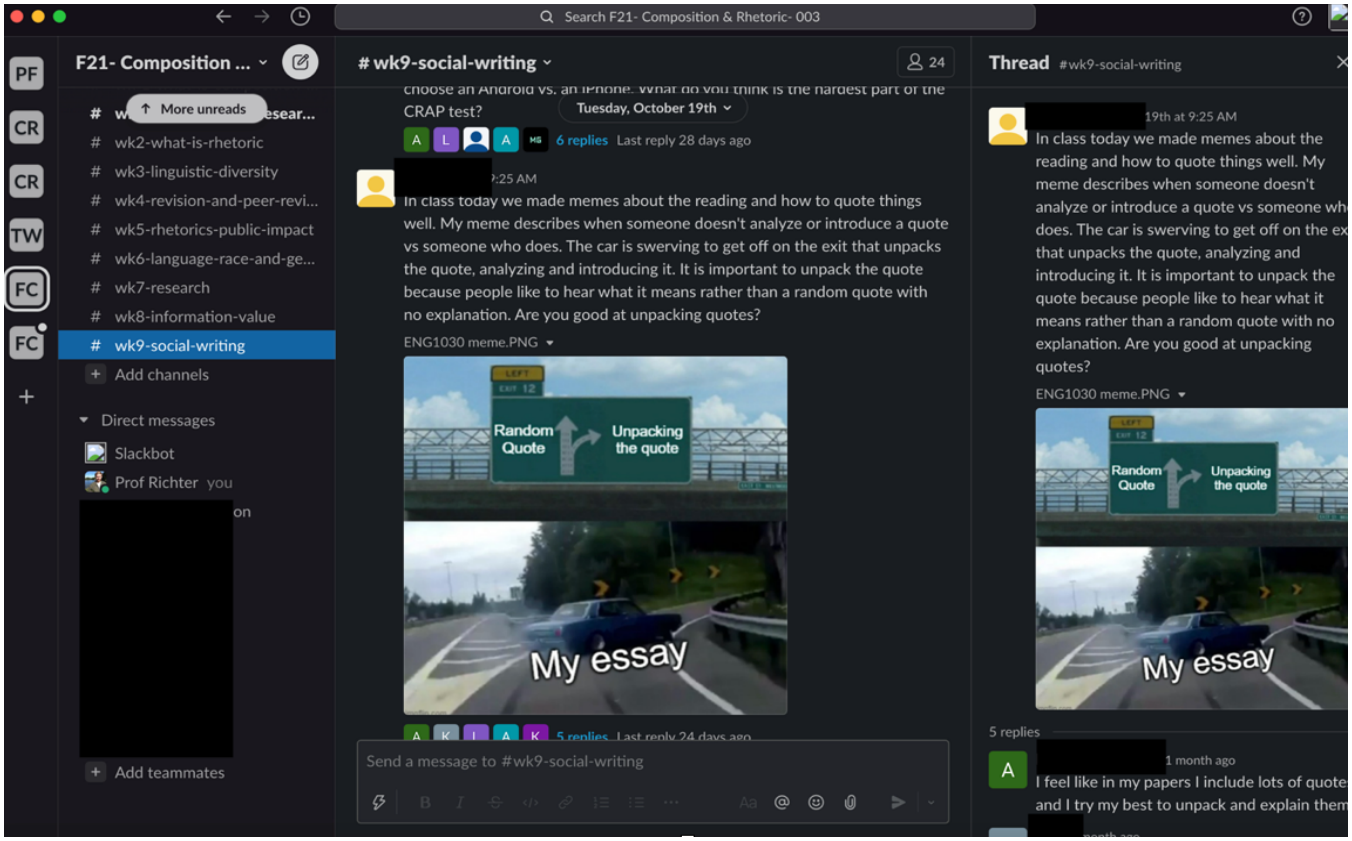
**Table 1**

*Examples of Codes that Emerged in the Data that Support the "Digital and Social Media Literacies" Category*

| | | | |
|---|---|---|---|
| Critical linking | Making a meme | Shares a video | Shares an image |
| Reflecting on rhetoric's role in media | Critical consideration of language | Reflecting on social learning or learning from/with others | Discussing affordances/challenges of digital writing |
| Participatiing with smartphone/tablet | Discussing the Internet writing process | Inventing a new mode of participation | Commenting or critique of platform/ interface |
| Monitoring afterlife of a Slack post | Discussing the online video creation process | Discussing emotional experience of writing in Slack/writing online | Critical sharing of an Internet link |
| Discussing how Slack writing transfers/informs academic writing | Discussing Slack helping to increase writing confidence | Discussing social media, rhetoric, & society | Statement of identity |
| Writing intertextually | Connecting course content to social media example | Meta-discussion of Slack discussion | Commenting on critical reading of others' ideas |
| | Considering information value/ CRRAAP test | Inventing with multimedia | |

**Figure 1**

*A Student Shares a Meme to the Slack Page Blending Written and Visual Communication, alongside Cultural References*



ideas easily." While digital writing represents the majority of Slack participation that students practiced, the sharing of links, creation of short videos, incorporation of images, and work inventing and communicating with other media showcases the multimodal invention practices that characterize social media participation, which oftentimes blends visual, sonic, hypertextual, video, and other media forms. Even a student who had primarily engaged only in digital writing expressed an interest in expanding their media use, writing of their Slack participation that "although I have not explored many of its features, my goal for the end of the semester is to become more familiar with them and post either a meme, something I create, or a video." .

## Development of Rhetorical Insights

Other codes that appeared in the data showcase varied literacy and participatory practices related to digital literacies. Codes like "Inventing A New Mode of Participation," "Reflecting on Rhetoric's Role in Media," and "Critical Consideration of Language" showcase digital literacy practices in action in a variety of ways and contexts. Students created new modes of participation on several occasions, designing new ways to participate that weren't provided by the course design from the start, but rather arose from students' assessment of existing participation practices and then active supplementation. As participation is an important part of digital literacy, inventing a new mode of participation represents a valuable practice that students engaged in within this social media pedagogy. Students also reflected on rhetoric's role in media, considering how different media products and institutions (e.g., news organizations, social media platforms, celebrities, and smartphones) use rhetorical strategies to address audiences, tailor messages, and achieve goals.

## Social Media Literacy Activity

A number of codes also appeared in the data that specifically and uniquely feature evidence of social media literacy development. While digital literacy and social media literacy have much in common, social media literacy obviously foregrounds the type of capacities to compose, read, write, and create within social media environments that are vital to developing digital literacy. In the data, codes such as "Discussing Social Media, Rhetoric, and Society" and "Connecting Course Content to Social Media Example" demonstrate how students not only learned more about how social media communication environments function, but also considered how the rhetoric, writing, and communication insights that were central to our course appear prominently in social media contexts. Students made explicit and detailed connections between social media communication environments, rhetoric, and social, cultural, and political issues. Connecting society and culture to social media communication environments, and especially doing so through digital writing and interaction processes, constitutes an important part of social media literacy. Other students commented on the social elements of composing on social media, sharing that "I think the [Slack] network allows creativity and individuality in an online setting." Another noted:

> [B]eing able to use social media's special features such as likes or comments, helped me respond and understand what others were thinking about my posts or helped me respond, so they understand what my side is on a topic or issue.

Furthermore, one student discussed how discussion in Slack helped them to broaden how they understand social media environments more generally. They wrote:

> Slack has taught me a whole different aspect of social media. It's a way to interact with people that isn't in the traditional social media ways of likes and posts and comments. Slack is different in that it is an interactive and constructive platform versus one where you are always worried about other people's reactions to your posts.

## Intertextual Writing

Students also engaged in the fashioning of digital identities and in intertextual writing, both vital components of digital and social media literacies. They engaged in meta-discussion about the tone, content, behavior, and attitudes of others within the Slack discussion, and they commented on critical readings of others' ideas along the way. Participants commonly mentioned in reflective journal entries that they especially appreciated insights into social media and digital literacies related to the appraisal and judgement of information, especially stemming from discussions on information value in class that used the Currency-Relevancy-Reliability-Authority-Authorship-Purpose (CRRAAP) test to appraise information.

The social media literacies that students demonstrated contribute to their larger understandings of both digital literacies as well as rhetoric and communication in networked social media environments. A participant commented that "I enjoy using Slack because it gives you a whole new perspective on social media and how it can actually be a positive thing and can be used for learning." Another noted:

> Writing in Slack causes me to have to think a little more out of the box as a writer, and approach Slack with a tone appropriate to the setting…. After years of writing standard five paragraph essays for teachers, I find it difficult to adopt the more casual tone needed for my Slack posts.

Others expressed enthusiasm about an ongoing process of identification and horizontal student-to-student bond formation with classmates, as one participant shared:

> When posting on Slack, I did find myself discussing rhetoric and social media with my classmates… personally I think the most fun examples were my post in week 3… about color use in rhetoric, and looking at [other students' posts] about the New Yorker magazine covers….it was cool to see that everyone who replied had the same or similar associations with colors and with each other and my roommates at home.

Some participants also reported that the social bonds developed between classmates have helped them to learn and to apply knowledge directly to class projects. One student reported in an interview:

> Slack allows me to better understand the topic by having a student explain in a different way than the professor, or I can determine that I am not the only one who is confused… Slack allows me to ask questions to my fellow students in a comfortable environment.

Furthermore, students expressed appreciation of the digital writing pedagogy's support for disagreement and genuine discussion and engagement, especially when compared to fully public social media environments. One student said: "On typical social media platforms, people do not always provide constructive criticism, but my experience with Slack has not been like that." Instead, for the most part,

> everyone gives healthy, constructive feedback and is open to hearing others' opinions… I enjoy when someone replies to me and has a different stance because it allows me to broaden my view on the topic and potentially influence or change my stance.

Moreover, a student participant observed similarities between writing in Slack and writing on other platforms in non-academic settings:

> Writing in slack [sic] is sort of similar to other social media spaces that I use like Instagram or Snapchat. It is different because you're not posting a picture along with the phrase that you write, but when you write about something in slack you know that there are going to be a lot of people reading it, just like you would in another social media platform. To me, knowing that other people are going to read my work makes me pay a little bit more attention about what I am writing and what I choose to say.

As these findings demonstrate, social media pedagogies can encourage learning of digital and social media literacies through a variety of forms, practices, and processes.

## DISCUSSION & BEST PRACTICES

This study's findings contribute to how scholars and instructors understand social media pedagogies (Conner & Webb, 2021; Daer & Potts, 2014; Day, McClure, & Palmquist, 2010; Johnson & Salter, 2022; Mina, 2017; Vie, 2017) and especially to how participation on social media can support digital literacy formation (Amicucci, 2020; Buck, 2023; Coad, 2013; Vie, 2008). In particular, insights into student learning and experiences within social media pedagogies that are demonstrated by codes appearing in the data like "Discussing Affordances/Challenges of Digital Writing," "Discussing How Slack Writing Transfers/Informs Academic Writing," "Commenting or Critique of Platform/Interface," "Discussing Emotional Experience of Writing in Slack/Writing Online," and "Making a Meme" stand to benefit how instructors pursue digital and social media literacy development in their courses. Furthermore, the findings orient how instructors can enact effective learning environment design in their social media pedagogies to support this sort of digital and social media literacy development.

For instance, the "Making a Meme," "Shares a Video," "Shares an Image," and "Critical Sharing of an Internet Link" codes contribute multimodal composing practices to disciplinary models for promoting digital and social media literacies like those offered by Selber (2004), Spilka (2010), and Mina (2017). As part of their learning environment design, instructors can encourage students to share images, links, videos, podcast episodes, and other media in the social learning community in an attempt to pluralize the forms of information students are interacting with and learning from. Multimodal compositions such as meme creation and video, image, or link sharing in an ongoing social learning community contributes to research connecting social media pedagogies and multimodal composition outlined by researchers like Vie (2008), Shipka (2011), and Palmeri (2012). Furthermore, findings related to "Discussing How Slack Writing Transfers/Informs Academic Writing" and "Discussing Slack Helping to Increase Writing Confidence" stand to benefit instructors designing learning environments that foreground digital writing's opportunities for knowledge transfer (Shepherd, 2018), expansion of traditional writing abilities (Mina, 2017), critical thinking (Coad, 2013), intertextual writing (Amicucci, 2020), and managing different audiences (Buck, 2023).

Moreover, as an exercise in digital and social media literacy development, the "Commenting or Critique of Platform/Interface" code suggests instructors can lead students in collective interrogation of platforms and the design choices that they make to consider how social dynamics of a learning environment might have been different with another platform (e.g., Discord, Mastodon, Facebook Groups). This can help students to consider the role that technologies play as "cultural artifacts" in facilitating social dynamics and the environments that writing takes place in, an important component of Selber's (2004) conception of multiliteracies (p. 25). Consequently, the findings of this study inspire some best practices that have utility across the curriculum, inviting instructors in TPC and beyond to encourage low-stakes multimodal composing, to have students consider online interactions and relationships, and to work with students to design guidlines and rules for participation in the social learning environment.

### Best Practice: Instructors Should Design Situations for Low-Stakes Multimodal Composing

An important way that students can develop digital and social media literacies is through multimodal composing using some combination of visual, sonic, written, or other media. Multimodal composition can oftentimes be framed through classroom initiatives that ask students to complete an isolated, particular project (Palmeri, 2012; Shipka, 2011; Sullivan, 2015). However, I contend that multimodal composition can also be practiced in ongoing, low-stakes, informal, participatory forms in social media channels to support digital and social media literacy development. This best practice, drawn primarily from the "Critical Sharing of an Internet Link," "Making a Meme," "Shares a Video," "Shares an Image," "Inventing with Multimedia," and "Discussing Online Video Creation Process" codes within the data, can support students' practical work engaging digital and social media literacy skills in action through low-stakes, participatory, interactive multimodal composing. As a best practice for learning environment design, instructors can encourage students to share images, links, videos, podcast episodes, and other media in the social learning community in an attempt to pluralize the forms of information students are interacting with and learning from.

### Best Practice: Instructors Should Discuss Online Social Interactions & Relationships with Students

Second, instructors using social media tools in their learning environment design hoping to support digital and social media literacy development should discuss with their students how online social interactions create meaningful relationships and opportunities

for learning. Arising primarily from the "Writing Intertextually," "Reflecting on Social Learning or Learning From/With Others," "Meta-discussion of Slack Discussion," "Commenting on Critical Reading of Others' Ideas," "Statement of Identity," and "Discussing Emotional Experience of Writing in Slack/Writing Online" codes, instructors can consider discussing online social interactions and relationships with their students to support digital and social media literacy development. Even as digital aggression and harassment remain vital challenges for networked learning environments to work against (Johnson-Eilola & Selber, 1996; Reyman & Sparby, 2020), the ability to learn and interact positively alongside others is a valuable ability for a contemporary communicator to have. As such, I encourage instructors to discuss online social relationships and interactions with students, actively considering what contributes to making them generative, productive, or effective in digital literacy situations. Instructors can also lead students in collective interrogation of platforms and the design choices that they make as an opportunity for students to consider how social dynamics of a learning environment might have been different within another platform (e.g., Discord, Mastodon, or Facebook Groups), helping students to consider the role that technologies play in facilitating the social dynamics and environments within which writing takes place.

### Best Practice: Instructors Should Collaborate with Students to Design "Rules" for Healthy Online Learning Environments

Finally, instructors should collaborate with students to design rules for behavior and participation in their online learning environments. Instructors have important opportunities to nurture equitable practices in their social media classroom learning environments, which guidelines have the potential to support. To cultivate equitable behaviors in social media pedagogies, collaborative construction of documents like a "Statement of Community Goals and Values" by students and instructors represents an important best practice in social media learning environment design. A "Statement of Community Goals and Values" document is a collaboratively designed set of participation rules that function as guidelines for participant behavior, as codes of conduct in the learning community, and as social discussion values to be practiced by stakeholders that are written in stakeholders' own language and with their unique circumstances in mind.

## CONCLUSION: LEARNING ENVIRONMENT DESIGN FOR TPC PEDAGOGY

As the operative question for many instructors continues to evolve from something like "Should I use social media tools like Discord or Slack in my course?" to "How do I optimize the success of my course's social media pedagogy?" considering learning environment design can go a long way toward finding the right fit between pedagogy, platform, learning goals, and social interactions between students. Careful attention to learning environment design in social media pedagogical environments can enable social interactions among students that can support the practicing (and learning) of digital and social media literacies, as this article has showcased. Learning environment design in social media educational spaces remains a compelling opportunity for innovative pedagogical designs that can help students to practice digital literacy activities in technical and professional communication courses and beyond.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# Connecting the User-Centered Design Process to Broader Outcomes in a Risk Communication Project

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## ABSTRACT

In this experience report, we describe our work incorporating user-entered design (UCD) into an interdisciplinary risk communication project. We focus on documenting the connections between process and outcomes, with the goal of demonstrating how UCD activities contributed to broader project development in measurable and tangible ways. We also provide recommendations for how the UCD process in interdisciplinary communication projects might be improved to overcome barriers to integration with other concurrent development processes.

## CCS Concepts

Human-centered computing →Collaborative and social computing →**Collaborative and social computing design and evaluation methods**

Social and professional topics → Professional topics → Computing and business → **Socio-technical systems**

## Keywords

user-centered design, risk communication, interdisciplinary, team science

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## INTRODUCTION

Interdisciplinary scientific research often includes applied communication objectives to help make science results more usable to public audiences and satisfy funding agencies' education and public outreach requirements. Incorporating communication research early on can help a research team shift from a one-way transmission or "trickle-down" model of communication to more sophisticated and engaged models (Lindenfeld et al., 2012). However, integrating communication research can be challenging due to different epistemic commitments among team members and institutional partners, stemming from perceived authority and validity of different disciplinary approaches (Suldovsky et al., 2018) or institutional and structural barriers (Cagle, 2017). Other researchers have described the need to share cases of end-user driven development projects that can be models interdisciplinary project teams may adopt (Collini et al., 2022; Wong-Parodi et al., 2020) and to support arguments to research teams and funding agencies that user-centered considerations should be fully funded and elements integrated throughout a project's entire course (Lauer, 2020).

In this experience report, we describe our work incorporating user-centered design (UCD) components into an interdisciplinary risk communication project, with a focus on documenting the connections between process and outcomes. Our primary goal is to demonstrate how UCD activities contributed in measurable and tangible ways to project development. Additionally, we provide recommendations for how interdisciplinary communication projects might improve the UCD process to overcome barriers to integration with other concurrent development processes and improvement of project outcomes.

We report on a three-year funded interdisciplinary team project, "The New First Line of Defense," whose primary goal was to support coastal residents of U.S. Gulf of Mexico states by providing equitable access to information intended to help them reduce risk to human life and property from natural hazards. Among other activities, this project developed a website ("HazardAware," https://www.hazardaware.org/) which provides information and

interactive tools about: (a) a "HazardReady Score" for more than 14 million homes that provides a composite metric intended to provide a single numeric assessment of a home's risk, built from loss estimates, community resilience, social and environmental vulnerability measures, and a building's age, (b) housing building-level local hazards and related impact history, (c) housing building-level structural vulnerability, (d) housing building-level safety mitigation costs, and (e) recommended community-level actions to mitigate natural hazard risks.

The project's core expectation was that providing tools to help individuals and communities make informed mitigation choices would lead to fewer damaged and displaced households, resulting in both the community and individual residents becoming more resilient (i.e., being able to recover from a natural hazard in less time, thereby improving the lead time they need to rebound and prepare for the next disaster event). Because increasing public awareness of risk information can potentially exacerbate structural inequities (Liddell et al., 2021; Smith & Anderson, 2018), community engagement with attention to social justice concerns was an important project component. Building useful and usable products for intended audiences and addressing community concerns required the team to engage in several social science and stakeholder-involved outreach and design activities through the duration of the project, including UCD (the focus of this paper), interviews, and formal and informal conversations with community housing and advocacy groups.

The project team had 15 co-principal investigators (Co-PIs) from the fields of risk analysis, economics, civil engineering, housing policy, coastal modeling, and technical communication; our roles were as a co-principal investigator (Stephens) and a funded graduate research assistant (GRA; Altamirano). The overarching goal of UCD was to ensure that the project team understood how to design and build tools that would be useful and usable to a variety of website users (e.g., non-scientists, risk communication professionals). Our primary role was to further the project's community resilience dynamics objectives via providing user feedback and recommendations on website design. Our secondary role was to inform the website architecture via engagement with the website development team, for which we provided technical communication expertise centered on usability, UCD, and interview research.

## UCD PROCESS AND OUTCOMES

HazardAware's UCD activities occurred in several phases spanning project initiation in late 2020 through rollout in late 2022, including defining use cases and user profiles, content audits of similar websites, formative interviews with target users, development of educational materials, beta version user testing, and a plain language content audit. Table 1 lists each project phase, the primary investigation method undertaken during that phase, UCD results that directly informed the website development process, and outcomes that applied more generally to the project as a whole. To illustrate how our project phases might fit into an overarching UCD framework, we also map the design activities in Table 1 in relation to Twomlow et al.'s (2022) framework for UCD in risk communication projects, which proposes a three-stage process of Define (defining risk context and user needs), Design (conducting iterative stages of design, prototyping, and user feedback), and Refine (test and refine suitability in a decision-support context). Human subjects research was conducted in Phases 3 and 5 after evaluation and exempt determinations by the UCF Institutional Review Board. After each UCD phase, findings were shared with members of the project via a Slack channel and reported on during monthly full-team virtual meetings. Below, we describe the activities taken during each phase and their outcomes.

### Phase 1: Identification of Target User Profiles and Use Cases

In Phase 1, Co-PI Stephens worked with team co-investigators to identify likely use cases and target user profiles for the proposed website. One of the primary purposes for this task was to guide recruitment of target users for Phase 3 formative needs assessment interviews. Profiles (Table 2) were generated from input by project principal investigators (PIs) based on their professional experience with risk communication and hazard information tools, as well as the context in which PIs expected the HazardAware website to be used. The two primary results that informed the website development process were (a) to clarify two major target user groups (users of individual-level information and users of community-level information) and (b) to identify target user groups for the Phase 3 formative interviews: homeowners, renters, and homebuyers, and communication and community management professionals.

The primary outcome of this UCD phase that affected the project as a whole was the identification of multiple target user groups, some with overlaps in information needs. This clarification gave nuance to the initial distinction, made in the project proposal, between the need to provide data at both the scale of individual homes and at the community level. The project team also decided to exclude commercial property owners and landlords as specific interest groups, to focus specifically on communicating with individual residents and users of community-level housing information. Finally, this phase also led to discussion among the project team of which of these target audiences (if any) would be prioritized during the design of the HazardAware website.

### Phase 2a: Content Inventory Audit of Flooding Websites

Phase 2 involved two content audits of comparable websites led by GRA Altamirano, here discussed as Phases 2a and 2b. Detailed results are discussed elsewhere (Altamirano & Stephens, 2022); here, we focus on how these audits fit into the overall project. Phase 2a was a content inventory of the risk communication features of 11 interactive flood communication websites, focusing on interactive maps and other data visualizations. For the website development process, the content inventory audit results allowed us to systematically evaluate the message characteristics and data used to create these items and to identify both possible genre conventions and specific communication tactics which might be applied to website design.

The primary outcome of this content audit that comprehensively affected the project was identifying potential methods for representing and contextualizing risk, thus helping to maximize our communicative effectiveness with our target audiences for both HazardAware and other project communication products (e.g., community group outreach materials). However, during development the decision was made to deemphasize the use of maps and other data visualizations to depict risk, which led to a second content audit (Phase 2b) that focused more specifically on how information about housing was depicted.

**Table 1**

*Phases of Project UCD Activity in Relation to Methods, Results, Outcomes, and Twomlow et al.'s (2022) Risk Design Framework*

| Design activity and investigation method | Results that informed the website development process | Outcomes that affected the broader project | Mapping to risk design framework |
|---|---|---|---|
| Phase 1: Defining Use Cases and User Profiles (consultation with subject matter experts [project PIs]) | Clarified two major target user groups: users of individual-level information and users of community-level information<br><br>These mapped largely but incompletely to two groups for formative interviews: homeowners, renters, and homebuyers, and communication and community management professionals | Identified multiple target user groups, some with overlapping informational needs<br><br>Gave nuance to the initial project distinction between data at the scale of individual homes and community-level data | Define stage |
| Phase 2a: Content Audit of Flooding Websites (content inventory audit) | Evaluated the data and methods used to represent community-scale flood risks in comparable websites, as well as approaches to representing and contextualizing risk | Identified potential methods for representing and contextualizing risk for incorporation into the website and other project products | Define stage |
| Phase 2b: Content Audit of Realty and Flooding Websites (comparative content audit) | Compared how flooding and real estate websites depicted building-scale and community-scale risk communication and data sources | Identified various techniques for conveying building-scale and community-scale information | Define stage |
| Phase 3a: Formative Interviews with Homeowners, Homebuyers, and Renters (semi-structured interviews with project area residents) | Assessed target users' previous experience with hazards and decision support needs<br><br>Obtained preliminary feedback on initial project design | Led discussions envisioning content changes: expansion of education section, addition of explanations about data calculation<br><br>Led discussions envisioning structural changes: inclusion of information targeted to renters vs. homeowners | Define & Design stages |
| Phase 3b: Formative Interviews with Professional Users (semi-structured interviews with project area communication and community management professionals) | Assessed target users' decision support and data needs<br><br>Obtained preliminary feedback on initial project design and HazardReady Score calculation | Led discussions leading to refinement of explanatory information and understanding data download needs for this user group | Define & Design stages |
| Phase 4: Development of HazardAware Educational Section (consultation with subject matter experts [project PIs]) | Drafted information architecture for educational section, consulted with project PIs to populate information | N/A: Results not applicable to other project research that was occurring at this point in the project process | Design stage |
| Phase 5: HazardAware Beta Version User Testing (user walkthrough with project area residents) | Assessed usability and understandability of website function using think-aloud protocol<br><br>Solicited recommendations for content and function changes<br><br>Generated list of recommendations for overall function and content and section-specific recommendations, organized by priority | N/A: Results not applicable to other project research that was occurring at this point in the project process | Refine stage |
| Phase 6: Plain Language Revision (plain language content audit) | Addressed identified language challenges by generating a list of recommendations for language changes and additional user instructions clarifications | Terminology suggestions were shared with team members developing various communication products | Refine stage |
| Ongoing usability consultation (meetings with project Co-PIs) | Provided feedback on various aspects of the project | Provided feedback on various aspects of the project | Define, Design, & Refine stages |

**Table 2**

*Target User Profiles and Use Cases Defined by Team Co-Investigators*

| Target user profile | User's hypothetical goals for using the website | User's hypothetical actions on the website to achieve those goals |
|---|---|---|
| Renter | Learn about major hazards in the target housing area<br><br>Learn about major hazards in their current home<br><br>Learn about "low hanging fruit" mitigation options (e.g., purchasing renter's flood insurance) | Search for information on hazards in a geographic area<br><br>Search for information on hazards in their current home<br><br>Search for information on what their landlord can do to mitigate hazards<br><br>Compare hazard information about specific homes |
| Homebuyer | Learn about major hazards in the target housing area<br><br>Learn about hazards at specific target homes<br><br>Learn about mitigation options on specific target homes | Search for information on hazards in a geographic area<br><br>Compare hazard information about specific homes |
| Current homeowner (including landlords) | Learn about major hazards in their current home<br><br>Learn about mitigation options in their current home | Search for information on hazards in their current home<br><br>Search for information on about what they can do to mitigate hazards<br><br>Compare costs for mitigating actions |
| Community planner or risk manager | Learn about major hazards in the target community | Search for information on hazards in their community<br><br>Compare the severity of different types of hazards in a location<br><br>Compare locations in terms of which hazards are most significant |
| Outreach specialist/ facilitator | Provide hazard information to the public<br><br>Show others how to use the website to find information | Easily access hazard information for a specific address<br><br>Easily access hazard information for a specific neighborhood<br><br>Demonstrate how to use the tool to answer specific questions |
| Local floodplain manager | Provide hazard information to the public<br><br>Earn Community Rating System credit for Map Information Services (depending on information provided in the tool) | Easily access hazard information for a specific address<br><br>Easily access hazard information for a specific neighborhood |

## Phase 2b: Comparative Content Audit of Realty and Flooding Websites

The second content audit focused on how information about housing was depicted in real estate and flooding websites. This comparative audit focused on how information about individual houses and communities was displayed in five real estate websites and two flooding websites; the risk communication features of the flooding websites had been separately evaluated during Phase 2a. For the website development process, our results enabled us to compare techniques currently in use for depicting both building- and community-scale information. For the broader project, the content audit outcomes identified comparable websites including information features (e.g., metrics, data formatting, representational techniques) that could help us communicate building- and community-scale information in both HazardAware and other project communication products.

## Phase 3a: Formative Interviews with Key Stakeholders

During the project's first year, we conducted two sets of formative Zoom interviews to develop an understanding of the needs and preferences of individual- and community-level information users for HazardAware. Phase 3a consisted of 12 interviews conducted by Co-PI Stephens over Zoom with individual-level

users (homeowners, homebuyers, and renters) in the study area. The first part of the interviews consisted of questions about interviewees' previous experiences with flooding and tropical storms or hurricanes, where they look for information about these hazards, and what hazard preparations they have made. Next, participants were shown draft sketches of the website. After features were explained, they were asked for their thoughts about the proposed website features and information. GRA Altamirano transcribed results and both authors collaborated on analysis, as discussed elsewhere (see Stephens & Altamirano, 2021; Stephens & Altamirano, 2024).

The primary results of these interviews informed the website development process, including assessment of individual-level information users' previous experience with hazards and decision support needs, and preliminary feedback on the initial project design. For the broader project, interview outcomes led to visioning discussions in which the team collaborated on both content and structural changes to the website as well as other outreach materials. Content changes included an expansion of the hazard education section and addition of explanations about how data were calculated. These changes were targeted toward future users who may not have preexisting hazard-related knowledge (education section information) as well as those who might have some knowledge and want additional detail (data calculation information). Structural changes for the website involved inclusion of information specifically targeted to renters and to homeowners, who had articulated different concerns for hazard mitigation options.

## Phase 3b: Formative Interviews with Professional Users

Also during the first year of the project, we interviewed seven professional users about the HazardAware website. Participants included emergency managers, consultants, outreach specialists, and community planners who the team anticipated would be primarily interested in community-level and secondarily interested in individual-level information. Co-PI Stephens conducted interviews via Zoom, GRA Altamirano transcribed results, and both authors collaborated on analysis as described in (Stephens & Altamirano, 2024). The first part of the interviews asked participants to describe their job responsibilities as they relate to natural hazards and housing and what tools or data they use. Second, they reviewed three draft graphics, while the interviewer described what the team envisioned building and asked questions about information content and organization: (a) the website landing or "start" page, (b) a draft schematic showing how the community-level information might be organized, and (c) a conceptual diagram describing the HazardReady Score. Finally, participants were asked how they could envision using the website and whether they had any comments about content or organization.

Similarly to Phase 3a, results informed the website development process by assessing professional users' decision support and data needs for the website and obtaining preliminary feedback on the initial website design and HazardReady Score calculation. For the broader project, outcomes primarily assisted the team in visioning discussions that focused on explanatory information to be offered via the website, other project products, and on data download needs for professional users. Our discussion about the HazardReady Score calculation provided less actionable information for the project team, as discussed in the Discussion and Recommendations for Practitioners section of this paper.

## Phase 4: Development of HazardAware Educational Section

Results of Phase 3 interviews showed the need to significantly expand the website's educational section beyond the initial project conceptualization. In Phase 4, the authors led planning for the information architecture of this section in collaboration with project team members. The primary results that informed the website development process led to development of a conceptual overview document and draft information architecture diagram (Figure 1) and coordination with the project team subject matter experts to populate content via online tools. These activities helped refine the structure and content of the education section of the website, including descriptions of different types of hazard mitigation and a calculator for lower-cost mitigation options like sandbags for flooding, as well as determining which definitions should be visible as tooltips and which needed a lengthy description. For the broader project, Phase 4 results were not applicable to other team members' research that was occurring at this point in the project process.

## Phase 5: HazardAware Beta Version User Testing

During the third project year, we conducted summative testing of a beta version of HazardAware with 11 individual-level target users. User testing was semi-structured, used a think-aloud protocol, and was conducted over Zoom; Co-PI Stephens conducted three sessions and GRA Altamirano author conducted seven. Participants began by entering an address into the website, then were asked to proceed sequentially through the different pages (i.e., Property Summary, Know Your Risks, Know Your Community, Be Risk Ready, and Learn More). Our general direction upon encountering each page was that participants explore the page and its features while verbally describing what they were doing and why. We occasionally prompted participants to describe what they were doing or why, interpret what they were reading in their own words, and go back to interact with features or information that they may have skipped. GRA Altamirano reviewed session recordings and notes and organized feedback page-by-page. Both authors collaborated on developing a list of design suggestions and questions for the project team.

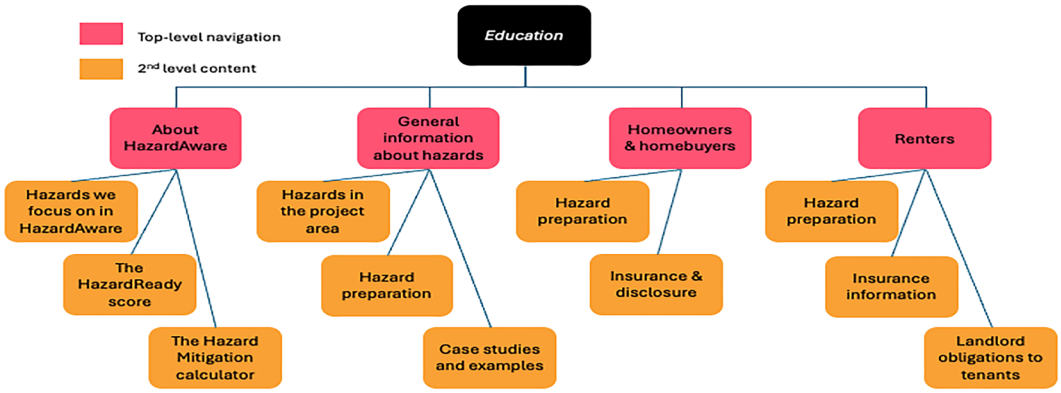
The results informed the website development process by (a) obtaining information about how users interpret the site's information and features, identifying confusing information and features, and listening to feedback, suggestions, and questions about functionality and content; and (b) generating a prioritized list of development recommendations for overall function and content and section-specific recommendations. The project PI and web development team then assessed and implemented the majority of suggested changes. Additional results of the user testing are discussed elsewhere (cf. Stephens & Altamirano, 2022). For the broader project, the results of this phase were not applicable to other team members' research that was occurring at this point in the project process.

## Phase 6: Plain Language Revision

In the final UCD phase, we implemented a qualitative content audit and website revision focused on plain language and information complexity. This phase had not been planned from the project outset, but its need was demonstrated in the Phase 5 user testing. GRA Altamirano completed a qualitative audit (Halvorson & Rach, 2012) of all website content following U.S. Government Plain

**Figure 1**

*Draft Information Architecture Diagram for Educational Section of HazardAware*




Language guidelines (https://www.plainlanguage.gov/guidelines/) and U.S. Environmental Protection Agency Plain Writing standards (https://www.epa.gov/web-policies-and-procedures/plain-writing), resulting in a detailed list of recommendations for website changes. Co-PI Stephens then worked with the project PI to develop wording suggestions that balanced technical accuracy and understandability. The audit results informed the website development process by addressing language challenges identified during Phase 6, including an actionable list of recommendations for language changes and additional user instructions clarifications. For the broader project, we shared terminology suggestions with team members who were developing various additional communication products.

## Ongoing Usability Consultation

In addition to our formal UCD activities, we provided ongoing usability consultation and feedback to other members of the project team, including the website development team and Co-PIs working on calculator tools and outreach development. Our primary contribution was during biweekly scrum meetings with the web development staff and Co-PIs, where we gave feedback on how best to represent and provide context for different types of hazard data. Additional feedback included input on color scheme selection for accessibility, presentation of preliminary UCD results about loss calculators and the HazardReady Score, and discussions about risk visualization methods.

# DISCUSSION AND RECOMMENDATIONS FOR PRACTITIONERS

Technical communication professionals should play key roles in all public-facing communication projects, including informing the design of more useful and usable communication materials and tools (Cagle, 2023; Lauer, 2020) and facilitating practitioner-community co-production of knowledge (Cagle, 2017; Kinsella, 2004). As the preceding narrative indicates, UCD activities contributed to the development of this project in several measurable ways. As expected, most activities contributed more directly to the development of the HazardAware website, particularly obtaining user feedback on design and functionality. Our contributions also added value to the overall project as a whole, for example by informing the work being done by other co-investigators and contributing to broader team discussions about project scope and definition.

Four specific outcomes of our work contributed to broader project success, extending beyond the ways our work contributed directly to HazardAware development. These outcomes demonstrate the usefulness of UCD in interdisciplinary communication projects, and we recommend that other interdisciplinary teams consider employing UCD methods:

1. We facilitated defining the project's target user groups (Phase 1), which is crucial for effective interdisciplinary research (Murray-Tuite et al., 2021).
2. The content audits (Phase 2) helped us identify techniques for spatial and visual risk representation, an important consideration for risk communication (Bica, Weinberg, & Palen, 2020).
3. The formative interviews and user testing (Phases 3 and 5) led to some modification of project communication scope and content based on articulated user needs and recognition of participant expertise (Adekola, 2018; Kinsella 2004), although these changes were constrained by specific objectives defined at the project funding proposal stage.
4. Our concluding plain language audit and development of communication guidelines (Phase 6) contributed to equity and social justice considerations (Jones & Williams, 2017), although some other team members' work addressed these concerns more directly (e.g., interviewing community environmental justice activists).

In retrospect, a few aspects of our UCD activities and the overall project team dynamics made our contributions less effective than they might have been, and thus represent barriers to integration and effectiveness of project outcomes. We discuss these with the goal of offering additional recommendations for others doing UCD work as part of interdisciplinary science team projects.

First, related to the structure of the project team, co-investigators engaged in several separate social science activities with a secondary objective of informing the design of HazardAware. It proved difficult to integrate their results because the team did not have a planned mechanism for translating results from all co-investigators and communicating it to the website developers. In one exception, we were able to use feedback from colleagues' focus groups with

low- to moderate-income homeowners and renters to inform our decision to add the plain language audit to our planned UCD work. Additionally, the website development team was included in the initial project plan as subcontractors (rather than co-investigators involved with strategic project discussions). The project team quickly realized that the web development team would have much more involvement throughout the project lifespan than originally anticipated, so some planned project activities and budgeting were restructured to significantly increase their overall participation. Our recommendation is that teams working on projects with significant tool development include a funded co-investigator designated as a technical project manager to help overcome communication barriers between developers and researchers. Two key tasks for this position would be to maximize translation of research results into actionable suggestions for implementation and to help developers articulate a clear understanding of the technical functionalities and capabilities of the tools to researchers.

Second, we identified structural issues related to project scope and deliverables in the project plan which affected project outcomes. First, the project team made several decisions about what types of information to include in HazardAware before we began working with users. Once these were defined as part of the team's scope of work, this constrained the extent to which user input could affect the website's overall structure. As discussed further in Stephens & Altamirano (2024), we recommend that projects weigh the social justice implications of early decisions that may affect use of a product for community advocacy. Second, as our work progressed we found a mismatch between specific reporting deliverables required by the funding agency and the flexible methodology of UCD. For example, our Phase 4 work on the education section was not part of our planned work. While work on this section developed from a need identified in the formative interviews, there was a mismatch with our expected deliverables that necessitated explaining the change in our funding agency reporting. While this was not an insurmountable obstacle, we recommend that others involved with UCD for projects that have specific reporting requirements consider how to articulate the need for flexibility in the project plan. Third, there was no funding allocated to post-rollout website maintenance or evaluation beyond our planned beta testing as part of the UCD. Others have noted that in end-user driven decision support tool projects, project evaluation post-rollout is often under-resourced and falls to the wayside (Collini et al., 2022) with detriment to long-term operations, for example, with data often becoming obsolete rapidly (Richards & Ball, 2020). We recommend that funding agencies consider allowing project funds to be allocated to post-rollout project evaluation and maintenance, when agencies' mandates allow this use of funding.

Third, we found that our individual formative interviews with professionals (Phase 3b) were less informative than those with individual users (Phase 3a). Professional users had questions about data inclusion, calculation methods, and specific elements like the HazardReady Score that we as non-subject matter experts could not answer during our discussions. Another type of participatory conversation involving team co-investigators who had a fuller understanding of technical details and specifications would have been more effective. In the initial project plan, interactions with professional users were envisioned as happening concurrently with public workshops about the project. Due to the COVID-19 pandemic these workshops unfortunately were not feasible, and the individual interviews did not fully capture their interactive affordances. We recommend that similar communication projects include group events during which team researchers and target users can interact more directly, such as outlined in participatory planning research (e.g., Collini et al., 2022), or even simply including one of the co-investigators with technical expertise in interviews (i.e., one of the science content experts).

While we encountered challenges in our UCD work as members of an interdisciplinary project team, we believe that our contributions added measurable value to overall project outcomes. Our work's impacts included both specifically informing design of the project's main product (HazardAware) and more generally contributed to the success of our co-investigators' research. We hope that this experience report offers helpful lessons to technical communicators and UCD professionals interested in participating in similar public-facing projects.

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# Book Review

# Queer Techné: Bodies, Rhetoric, and Desire in the History of Computing

By Patricia Fancher

Fancher P. (2024). *Queer techné: Bodies, rhetoric, and desire in the history of computing*. National Council of Teachers of English.

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*Queer Techné: Bodies, Rhetoric and Desire in the History of Computing* is a little book doing big things. Author Patricia Fancher presents a well-theorized recovery of both queer lives and the lives of women in the history of computing, something of great import to scholars in technical and professional communication (TPC). Fancher engages with queer theory, rhetoric, technical communication, historiography, archival studies, mathematics, computers, and engineering, resulting in a robust interdisciplinary work. At the center of the book is Alan Turing, a pioneering mathematician and gay man, but just as important are the people around him—his queer community and the women of the University of Manchester Computer Lab. Fancher uses queer and embodied techné to explore these communities and the writing that occurred within them. Through this, she presents a case that pushes back against popular narratives of Alan Turing as a solitary genius while also bringing forward the embodied human presence in computing and TPC.

The book's first chapter defines queer techné as a space that pushes for play and joy in the embodied process of "learning by doing" (p. 5). Fancher specifically notes that queer techné is "attuned to the craft of desire, […] especially the desires that resist heteronormative constraints" (p. 16). This definition lays the groundwork for Fancher's application of queer techné as a methodology in her analysis of two of Turing's articles and the archival research she conducted with the University of Manchester Computing Lab. This corpus includes letters shared between Turing and his queer community and the records of work done by the women of the lab, which included the embodied, physical labor of working with the machines. As the chapter progresses, Fancher introduces us to the core theme of the book, queering technical communication. This is done through an exploration of frequently overlooked elements of the history of computing, such as colonial legacy, queerness, women's labor, and how these elements overlap and coexist. Fancher also calls attention to researcher positionality, and how personal experience can shape us as well as our research, using herself and her research for this book as an example.

The second chapter shifts the focus to Alan Turing and provides a close analysis of two of Turing's most well-known articles, "On Computable Numbers, with an Application to the Entschiedungsproblem," wherein he posits the Turing machine—a theoretical computing machine—and "Computing Machinery and Intelligence," which gave us the Turing test—now considered the quintessential test of machine intelligence. Here, Fancher uses story to interrogate the ideas of the "lone inventor" and the "eureka moment" by considering Turing's own words on how he came to the idea of the Turing Machine and the reality of the communities of his lab. Fancher first places Turing in the context of the field of mathematics by unpacking what the dominant mathematical theories had been before, during, and then after World War II—a move from math as stable and logical to math as chaos. She then argues, very effectively, that Turing's embodied experiences were key to his theorizing, drawing on Judith Butler's (1990) definition of gender performativity as becoming. Gender performativity posits that we gain public recognition as a specific gender by performing that gender in alignment with social norms and expectations. From this, Fancher notes that the original Turing test is directly connecting the idea of performing gender to performing intelligence, specifically the 'emotional intelligence' often associated with women. This gendered core of the Turing test has frequently been erased by scholars studying the history of computing (p. 49). In bringing it to the fore, Fancher recovers and reinserts important queer elements into current conversations about AI and machine learning, which she explores further in chapter three.

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Fancher's focus on the *positive* impact of queerness on Turing's life and work plays a key role in her assessment of Turing's work and peer relationships. Chapter three, the heart of Fancher's archival research, presents letters from three of Turing's queer friends and colleagues—Christopher Strachey, Robin Gandy, and Norman Routledge. These specific letters were chosen for how they straddle the line between "erotic and intellectual work," an intersection that has not been closely examined and that Fancher draws forward as queer recovery in the archives (p. 66). Fancher positions queer friendships as spaces that allow for play and even flirtation to enter into technical communication. She opens the chapter by introducing Strachey's love letter program for the Manchester Mark 1 that produced the first computer generated text. The playfulness contained in these computer-generated love letters speaks to the joy and play of queer techné as well as the resistance of queer rhetorics—in this case, resisting the dominant thought of computers as tools of only utility and efficiency (p. 69).

Fancher compares the output of Strachey's generator, with its playful, borderline horny, tone, with the output of ChatGPT when the LLM was asked for a similar love letter, which Fancher describes as generic, heteronormative, and "unable or unwilling" to engage with queer and embodied desire (p. 73). This sort of heteronormative gap in modern machine learning discourse and in the history of computing can be addressed through the sort of restorative work that Fancher is doing by uncovering queer joy in the correspondence between Turing and his friends. The subsequent discussion of letters from Gandy and Routledge outlines the queer kinship networks that Turing had as support, pushing back against the popular image of Turing as sad and isolated his entire life. Fancher concludes the chapter by invoking queer techné as a form of code switching that helped Turing and his queer cohort signal queerness via listening for longing and community. This is where Fancher's positionality as a queer researcher affords her an ability to *also* perform this "queer rhetorical listening" (p. 88). She sought the threads of queer techné in Turing's archives, which she found because Turing's friends had taken the time to catalogue and preserve his papers.

Chapter four then turns to the women of the lab, introducing Cicely Popplewell and Audrey Bates, who were skilled programmers and administrators. These women, Fancher argues, occupied a space of embodied techné where the focus falls on the physical reality of working so closely with the machines. Fancher connects the hands-on relationships these women had with the Manchester Mark 1 to the emotional connections they made with the machine and each other and how those connections helped them negotiate access to the machine for the (male) professionals seeking to use it. Using archived computer logbooks and administrative letters, Fancher showcases the expertise of these women going far beyond simple operation into repairing, troubleshooting, and experimenting with the machines. This is another case of recovering important pieces of computing history that have been understudied, in part because the archives for the women of the labs are less robust. Fancher also provides an excellent model for how to navigate complicated intersections of marginalization in the fact that there *wasn't* solidarity between the queer men and the women in the lab, even as both stories are important to tell.

In the fifth and final chapter of Queer Techné, Fancher presents her own experience as a queer woman to situate queer techné as a methodology that can extrapolate "how gender and sexuality are embodied differences that can enrich and enliven" (p. 112) our work and research in technical and professional communication. Specifically, she invokes queer techné as a way to locate and create embodied knowledge and knowledge making practices that bring our positionality as researchers/scholars to bear on the work we do. This is particularly important for scholars of queer history, which is vital for queer futures. Fancher models this use of queer techné to address archival gaps, such as why there isn't *more* in Turing's archive or the difficulties of locating a computer operator who is only listed in the logbook by her maiden name. I always appreciate a text that models the theory or methodology that it puts forward, and Fancher does exactly that. She doesn't just say, "Here's a methodology I think is important," she shows us how it was important for her.

Fancher's highly interdisciplinary work showcases how versatile rhetoric and TPC can be, and it does a thorough job laying out the theories and methodologies she builds on. This may make the beginning of the book feel theory-dense but the clarity that results from Fancher's detailed explorations more than makes up for that. The book also shows the value in bringing together methods and methodologies from multiple disciplines to facilitate nuanced analysis. The varied paradigms here provide a rich, multi-faceted lens to reassess Turing's archives and writing. Fancher highlights the connections between writing, embodiment, and community, and brings forward the importance of physicality and emotion in writing. In presenting both a history and a methodology, *Queer Techné* is applicable to scholars and professionals in multiple areas of rhetoric and TPC from writing education to machine learning to history and beyond. As we navigate the numerous anxieties surrounding artificial intelligence (AI) writing, having a book that explores a history where AI writing is conceptualized as emotional, embodied, and queer can lead us to new ways of understanding how we engage with, understand, and communicate about AI. Furthermore, Fancher provides a nuanced approach to navigating queerness and gender in TPC, attending to the personal embodied nature of our work and how our communities shape that work. *Queer Techné* affirms queer knowledge's past and continued contributions to the fields of rhetoric and TPC.

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## ABOUT THE REVIEWER


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# Book Review

# Environmental Preservation and the Grey Cliffs Conflict: Negotiating Common Narratives, Values, and Ethos

By Kristin D. Pickering

Pickering, K. D. (2024). *Environmental preservation and the grey cliffs Ccnflict: Negotiating common narratives, values, and ethos*. Utah State University Press..

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Kristin Pickering presents a valuable case study that focuses on how professional communicators and researchers make sense of the narratives and values between stakeholders who may be at odds with each other. This is especially important in land usage and environmental protection cases like the Grey Cliffs, where the practices of private citizens and government regulated organizations conflict. Through Pickering's well-structured case study, she shares a fascinating web of documentation practices, discourse expectations, and community narratives and how they affect the communication practices between organizations and communities.

Pickering's book jumps right into the narrative of the Grey Cliffs, its community, and the government organization calling for change. Grey Cliffs recreation area is an open wilderness area and lake in Tennessee at risk of losing its public access. Since the 1940s, the recreation area has been controlled by the US Army Corps of Engineers for hydroelectric power generation. Pickering's research constructs a history of problems at the research site, including, crime, litter, and historic land rights issues, government control, anti-government sentiments, environmental and land degradation, pollution, and conflicting expectations of land usage between both communities involved. With a traditional rural working-class community on one side and a federal government organization on the other, this case study is packed with narratives, communication breakdowns, and strategies for positive communication practices. Ultimately in *Environmental preservation and the Grey Cliffs conflict*, Pickering posits that understanding polarization in the community views, values, and ethos is important to developing a relational ethos for conflict resolution.

Pickering breaks the book into eight chapters, of which the first two focus on the case study design, methodological and theoretical frameworks, and expectations for readers. The first chapter is focused on study design and background information on the Grey Cliffs as a research site. It explains Pickering's use of qualitative ethnographic research methodologies that include fieldwork practices focused on "lived experiences" and communication strategies of those involved in the conflict. These methods allow Pickering to give voice to complicated communication practices and the power structures that need to be negotiated, with the ultimate goal of creating an understanding of the cultural history that surrounds the case study.

The second chapter does much of the heavy lifting of Pickering's study by providing readers with a rich, narrative-focused framework. Her research develops through the use of narratives to reflect and understand communal cultures such as the Grey Cliffs community or the organizational culture of the Army Corps. This framework focuses on a combination of traditional narratives (communication practices of dominant communities), counterstories (complete stories that challenge the accepted stories as they call for change), and antenarratives (fragmented or symbolic stories which often become the only agency non-dominant groups have). Pickering defines her secondary framework as ethos building, which focuses on the connections between various public narratives and calls for social action through a lens that focuses on equal credibility and character of the participants, rather than on social capital. By combining these two frameworks, Pickering's work leans into the influences of environmental issues (e.g., land degradation and ownership rights) and social justice (e.g., classism and historical land access) and their role in participants' rhetorical choices throughout the Grey Cliffs conflict case study. This allows the research to reveal the negotiations that happen with communication and agency within high-stakes contexts.

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Chapter three focuses on the communication processes at the beginning of the conflict between the Army Corps and the Grey Cliffs community. Pickering analyzes the importance of aligning the values of both communities before the main topic of conflict can be discussed effectively. She explains that the values held by the Grey Cliffs community include religion, tradition, recreation, skepticism of government, skepticism of authority, unity, and equality and are often at odds with the Army Corps communication plans. Each community value became a roadblock to the Army Corps discussions of land usage along the Grey Cliffs recreation area because the ethos of communication was conveyed differently, which led to faulty communication practices and more distance in the communication. Pickering calls on communities and professional communicators to focus on clarity in communicating values, practices, methods, and beliefs, and she extends this call throughout the book.

In chapter four, Pickering follows David Edwards, resource manager for the Army Corps, as he faces resistance from the Grey Cliffs community as an outsider. David's first attempt at communicating with the community as the regulator for the Grey Cliffs site ended in failure, and Pickering shares how David's communication missteps cement him as an outsider and unworthy of the community's effort. For example, his appeals to authority and experience misalign with community values and lead community members to distrust him. Ultimately, Pickering's findings focus on the long processes of negotiation, failure, and renegotiation that David went through as he developed as a communicator throughout the conflict. Pickering's key takeaways are in how David identifies the need for a shared ethos and identity between himself and the community (such as through shared military experiences and the acknowledgement of the recreation area's importance to the community's sustainability) in future attempts at communicating about the Grey Cliffs site.

In chapter five, Pickering follows one community member, Norma, as she tries to generate solutions to the growing Grey Cliffs problem and its potential closure, while facing pushback from her own community. The trials that Pickering shares show how Norma's values did not reflect the Grey Cliffs community because of how she chose to focus her arguments on ideals that conflicted with the local history and culture. Using examples from Norma's narrative, Pickering calls for professional and technical communicators to create fully developed rhetorical personas that reflect both the individual and the values of the community in which they are communicating.

As chapter six begins, Pickering returns to David Edwards as he realigns his communication practices with the community's values and needs. His pivot from highlighting Army Corp regulations to focusing on relationships between himself and the Grey Cliffs community could not happen without the initial failures Pickering shares in chapter three. Edwards co-constructs a new ethos and agency with the community with a new understanding that he cannot ask of the community without also providing as part of it himself. Through this example, Pickering calls for two things from professional communicators. The first is patience, as changing community values and understandings often takes time, and the second is humility, as co-creation requires a balance of agency on all sides.

Pickering focuses chapter seven on the co-constructing of the narrative that developed between the Grey Cliffs community and the Army Corps. The narratives from multiple stakeholders in this process could not happen without commitment and effort from either side. The chapter highlights how two groups of communicators began shifting the narratives from "us versus them" to "we" as both sides worked to revise, replace, and agree to a changed set of community values. One way in which this happened was with coregulation of the recreation area between the Army Corps and community, giving both sides power in controlling the land. While the communication alignment developed, Pickering's research explains there cannot be perfect alignment in these cases but there can be enough alignment to establish a common ground.

In the book's final chapter, Pickering shares her own reflections three years after the resolution of the project. She offers a sense of hope for the future of the project and the current state of communication between the Grey Cliffs community and the Army Corps. She calls on communicators to focus practices on the co-construction of agency in communication between stakeholders, the need for renegotiation and reflection between organizational communicators and their publics, and the potential for changes in the long-term interactions as communities and communications evolve. Readers should note that as Pickering concludes *Environmental preservation and the Grey Cliffs conflict*, she reminds us that communication between stakeholders, especially between industries and their publics, is never complete. Communication is always a long-term relationship constantly at risk of failure and therefore in need of continued attention, even long after initial projects are completed.

Pickering's work is useful for a variety of technical communicators, business communicators, environmental researchers, and community activists. She provides a useful case study for practitioners to observe the developing communication practices between communities and organizations.

Her book also demonstrates how narratives can be used as productive tools for communicators to connect with communities, understand their values, and learn their histories.

*Environmental preservation and the Grey Cliffs conflict* accessibly provides clear takeaways and communication practices. Pickering's work is a useful addition to the fields of technical, organizational, and environmental communications. It expands on recent works in technical communication, such as Elizabeth Angeli's (2018) *Rhetorical work in emergency medical services*, and seminal technical communication texts, like Beverly Sauer's (2002) *Rhetoric of risk*, through its focus on developing better understanding of communication practices between discourse communities, preventing communication conflicts, and establishing practices of communication and research in the field..

Pickering's choice to focus on agency and narrative practices of communication expands our understanding of communication practices between organizations and their publics, while giving voice to publics in ways that feel natural. Pickering further emphasizes her strategies and recommendations for professional communicators, environmental scientists, and public policy workers through the addition of bullet pointed "key recommendations" after the conclusion of many of the chapters. These "key recommendations" also provide concrete strategies that support instructors of courses in technical or professional communication. Her work provides a compelling "real world" case study and strategies to implement better communication through narratives and practices that support the co-construction of knowledge between organizations and communities.

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## ABOUT THE REVIEWER

Phillip Lovas is a PhD student in English at Old Dominion University, focusing on rhetoric, technical and professional communication, and pedagogy practices. His research interests include social/rhetorical memory and community memorialization when entrenched industries leave their communities. His current project focuses on the social memory practices that emerge when professional sports teams relocate away from their historic fanbases. When he is not studying for classes or researching for his dissertation, he is teaching first-year composition and professional writing courses, playing video games, or participating in Dungeons and Dragons campaigns.